THE PLANT DISEASE REPORTER

Issued By

The Plant Disease Survey

Supplement 35

Disease of Cereal and Forage Crops in the United States in 1923

September 1, 1924

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF CEREAL AND FORAGE CROPS

IN THE UNITED STATES IN 1923

Prepared by R. J. Haskell, Plant Pathologist,
Plant Disease Survey.

CONTENTS

INTRODUCTION

The following summary of cereal and forage crop diseases in the United States is modeled after those that have preceded it in other years. The sources of information are the same, namely, (1) the collaborators of the Plant Disease Survey, (2) the Office of Cereal Investigations of the U. S. Department of Agriculture, (3) recent literature, and (4) the Plant Disease Survey of the Dominion of Canada (Survey of the prevalence of plant diseases in the Dominion of Canada 1923, fourth annual report). Only a small amount of information contained in this Canadian report has been used in the present summary and so readers are referred directly to it for detailed information regarding Canadian diseases.

An attempt has been made to condense the 1923 summary even more than those for other years by incorporating in it only the new facts that have been obtained during the year and by quoting fewer of thecooperators' reports than heretofore.

Nineteen hundred and twenty-three was not an unusual year for cereal diseases in general. Some diseases were more, and some were less prevalent than usual and naturally they varied greatly in severity in different parts of the country. Since stem rust is one of the most important cereal diseases and because of the recent efforts to control it through eradication of the barberry, the outbreak of this disease in parts of the spring wheat area was especially noteworthy. The disease was more serious than it has been for the past two years, but the epidemic was not nearly so severe as those of 1916 and other years prior to the barberry eradication efforts.

Another noticeable feature of the cereal disease situation was the comparatively light attack of the leaf rusts of wheat and rye. During 1921 and 1922 these diseases were quite destructive, but in 1923 they were noticeable for their absence in many cases.

Black chaff of wheat was particularly conspicuous in the states from Oklahoma northward, and somewhat more wheat scab than usual occurred in the upper Mississippi River Valley. Diplodia dry rot of corn was serious especially in the central and western sections of the corn belt.

Several diseases are worthy of special mention on account of their being comparatively new in this country, or because of their increasing severity.

Among these are flag smut of wheat, which now is known to occur in three States, take-all of wheat, the powdery mildew of red clover, that has been epiphytotic for the past three years, the "pasmo" disease of flax, an apparently recent introduction, corn mosaic in Louisiana, head smut of corn in Washington, and the bacterial diseases of soybeans and cowpeas.

New Diseases
(See following text for details)

The following organisms were found for the first time to be the cause of cereal and forage crop diseases in the United States during 1923.

Barley

Helminthosporium californicum described from California.

Corn

Cephalosporium acremonium Corda. Reported by Reddy and Holbert as widespread in the United States.

Sorghum and broomcorn

Bacterium andropogoni was described by Charlotte Elliott and E. F. Smith.

Clover

Sphaerulina trifolii, first time reported in this country; Missouri, New York, Illinois, on T. repens, T. hybridum, T. pratense.
Bacterium trifoliorum n. sp., Wisconsin, North Carolina, District of Columbia, Iowa, Indiana, Virginia, and Maryland on Trifolium spp.

Cowpea

Bacterium vignae n. sp. described from Indiana. Reported also from Florida and Kansas.

Soybean

Diaporthe sojae n. sp., described from North Carolina. Also reported from Indiana.
Peronospora sojae n. sp., described from North Carolina.

Grasses

Bacterium alboprecipitans on Chaetochloa spp., Arkansas.
Bacterium coronafaciens ~~atropupureum~~ † on Agropyron repens, Bromus inermis, and by inoculation on Bromus spp., Wisconsin and North Dakota.
Bacterium panici on Panicum miliaceum, Wisconsin and South Dakota.
Helminthosporium spp. described by Drechsler (see text).
Mosaic on various grasses (see text).

† ATROPURPUREUM

Diseases found in new localities
(See text for details)

Wheat

Flag smut (Urocystis tritici Koke.) Kansas-Wyandotte, Leavenworth.

Atchison and Miami counties. Additional counties of St. Charles, Warren, Platte, and Buchanan in Missouri, and Macoupin, Greene, Scott, Logan, and Hancock in Illinois.

Take-all (Ophiobolus cariceti (Berk. and Br.) Sacc. North Carolina - Lincoln, Iredell, Cabarrus, and Alexander Counties. Tennessee - Knox County. California - Yolo County. New counties of Riley in Kansas and Clackamas in Oregon.

Foot rot (Wojnowicia graminis (McAlp.) Sacc. & D. Sacc. - New York.
Disease caused by Sclerotium rhizodes Auersw. - Washington.
Downy mildew (Sclerospora macrospora Sacc.) - Delaware.
Disease caused by Bacterium atrofaciens McCulloch. - Nebraska and Montana.

Rye

Loose smut (Ustilago tritici) Kentucky
Stem smut (Urocystis occulta) Ashland County, Wisconsin. The first report from this section of the state.

Barley

Take-all (Ophiobolus cariceti (Berk. & Br.) Sacc. California.

Buckwheat

Leafspot (Ramularia rufo-maculans Pk.) Indiana.
Leafspot (Ascochyta fagopyri Bres.) New York.

Flax

Pasmo (Phlyctaena linicola Speg.) Wisconsin, Minnesota and South Dakota.

Alfalfa

Root rot (Sclerotinia trifoliorum Eriks.) New York.
Violet root rot (Rhizoctonia medicaginis (DC.) Tul. Michigan.
White spot (Undet.) Michigan.
Nematode (Tylenchus dipsaci) Colorado.
Slime mold (Physarum sp.) Kansas.

Clover

Powdery mildew (Erysiphe sp.) Colorado.
Mosaic (Undet.) Louisiana - on red clover.
Root rot (Sclerotinia trifoliorum Eriks.) New York and Idaho.

Sweet clover

Ascochyta sp., Louisiana.

Cowpea

Nematospora phaseoli, - Illinois. (new host for this organism)

Mosaic

Mosaic, or mosaic-like diseases, were found on the following cereal, grass, and leguminous hosts during the year, - wheat, corn, alfalfa, clover (red, white, alsike and crimson), sweet clover, cowpea, and soybean.

SEED TREATMENT OF CEREALS

During the past two years much activity has been displayed by pathologists in the testing out of various chemical dusts, particularly copper carbonate, for control of cereal smuts, and in the comparison of these dusts with the standard formaldehyde and copper sulphate treatments. Many of these experiments have been conducted on a cooperative basis under the leadership of a committee representing the Crop Protection Institute and the American Phytopathological Society. The results of this cooperative work for 1923, participated in by ten states and four provinces in the Dominion of Canada, have been made available in mimeographed form (10). The following conclusions are given in the report (page 6).

> "Copper carbonate dust was the most satisfactory in controlling bunt of wheat and smut of hulless oats. This is true from the standpoint of seed germination, smut control, and yield. The copper carbonate dust reduced the amount of smut of hulled oats and covered smut of barley in all trials; but in about one-half of the tests the amount of reduction was slight. For these smuts it appears that copper carbonate dust is not as effective as formaldehyde, but in view of the lack of seed injury, the increased yield, and the many advantages of application, it is worthy of further trial.
>
> "Nickel carbonate did not effectively control any of the smuts, but in many cases it stimulated germination and gave increased yields over the check. None of the dust treatments gave consistently better results than copper carbonate."

Extensive trials by the Office of Cereal Investigations of the U. S. Department of Agriculture, (7, 11, 13, 15) and reports of collaborators from Virginia and Arizona, not included in the cooperation mentioned above, corroborate the above conclusion that copper carbonate is effective in the control of bunt of wheat.

Seed treatment with the new organic mercury compounds has also received much attention of late, especially from pathologists in the Office of Cereal Investigations. Tisdale, Taylor, and Leukel (14) have secured good control of the barley and oat smuts with several of the organic mercury compounds and have even increased the yield of barley in the absence of smut. Johnson, Leukel, and Dickson (6) have shown also that several of these compounds will control barley stripe (Helminthosporium gramineum) perfectly and at the same time not impair seed germination. Seed disinfectants having organic mercury as an active principle appear to have very promising possibilities in the control of diseases. They more nearly approach the ideal seed treatment compound, which not only controls disease but also stimulates the crop, than anything that has yet been tested.

The following are some of the reports regarding seed treatment that have been received directly by the Plant Disease Survey and are not included in the references given below.

Barley - Loose and covered smuts

Delaware: One grower disinfected his seed with "Semesan" and reduced covered smut from 22% to 0.5%. One field of spring barley where seed had been treated with Semesan showed only a trace of loose smut while untreated seed showed 1%. (Adams)

Seed treatment of cereals

Kentucky: Hot water treatment being used extensively in Fayette County with very satisfactory results with both loose and covered smuts. (Valleau)

Michigan: All seed stocks for increase in Michigan are given the hot water treatment. (Coons)

Barley - Helminthosporium diseases

Delaware: Spring barley treated with Semesan showed complete control of stripe while check contained 0.5%. In a field of winter barley treated with the same substance only 1% leaf blotch (H. sativum) was found on the lower leaves while 20% was found on the check. (Adams)

Wisconsin: Organic mercury compounds satisfactory in the control of both the spot blotch and net blotch. (Vaughan)

Recent literature:

1. Coons, G. H. Copper dust successful against stinking smut. Michigan Agr. Exp. Sta. Quar. Bul. 1: 3-8. Aug. 1923.
2. Dickson, B. T., R. Summerby and J. C. Coulson. Experiments in the control of oat smut. Ann. Rep. Quebec Soc. Prot. Plants. 15: 102-103. 1922-1923.
3. Fraser, W. P. and P. M. Simmonds. Cooperative experiments with copper carbonate dust and other substances for smut control. Scientific Agr. 3: 297-302. May 1923.
4. Fraser, W. P. and P. M. Simmonds. Dusting with copper carbonate and other substances for smut control. (Abstract). Phytopath. 13: 293-294. 1923.
5. Heald, F. C., G. L. Zundel and L. W. Boyle. The dusting of wheat and oats for smut. Phytopath. 13: 169-183. 1923.
6. Johnson, A. G., R. W. Leukel, and J. G. Dickson. New seed treatments for controlling stripe diseases of barley. (Abstract). Phytopath. 14: 42. Jan. 1924.
7. Mackie, W. W. and F. N. Briggs. Fungicidal dusts for the control of bunt. California Agr. Exp. Sta. Bul. 364: 533-572. May 1923.
8. Nelsall, A. Experiments on the dust method of smut control. Scientific Agr. 3: 303-307. May 1923.
9. Orton, C. R., E. C. Stakman, and E. B. Lambert. Results of cereal seed treatments, 1922. Crop Protection Institute. Unnumbered Mimeo. Cir. 1923.
10. Orton, C. R., E. C. Stakman and H. H. Flor. Results of cereal seed treatments 1923. Crop Protection Institute. Unnumbered Mimeo. Cir. 1924.
11. Stephens, D. E. Results of experiments on bunt prevention at Moro, Oregon, 1923. Cereal Courier. 15: 273-277. Sept. 1923.
12. Stakman, E. C. and E. B. Lambert. Dusting seed grain to prevent smut. Minnesota Agr. Ext. Spec. Bul. 70: 12. 1923.

13. Tisdale, W. H., J. W. Taylor and M. A. Griffiths. Experiments with hot water, formaldehyde, copper carbonate, and chlorophol for the control of barley smuts. Phytopath. 13: 153-160. April 1923.
14. Tisdale, W. H., J. W. Taylor and R. W. Leukel. Further studies on new seed disinfectants. (Abstract) Phytopath. 14: 43-44. Jan. 1924.
15. Tisdale, W. H., J. W. Taylor and R. W. Leukel. Report of seed treatment experiments for the control of smuts in wheat, barley, and oats in 1923. Cereal Courier 15: 221-225. Sept. 1923.

DISEASES OF CEREAL CROPS

WHEAT

Bunt caused by Tilletia laevis Kühn and T. tritici (Bjerk.) Wint.

Tilletia laevis occurred scatteringly over most of the wheat producing area of the United States with the possible exception of the Northwest, where Tilletia tritici is the predominating and important bunt. Except in the Northwest and locally in Delaware, Indiana, and Illinois the disease was reported of slight importance.

Idaho and Washington experienced more loss from bunt than usual, 8% infection being estimated in each state. Considerable infection also occurred in Montana, Oregon, and California. It is in this general section of the country that bunt is most severe.

In Delaware, J. F. Adams reported a decided increase in bunt, the millers in some sections docking farmers 15% on account of the disease. In Indiana statewide occurrence with a marked increase in prevalence was reported by C. T. Gregory. In Illinois, where the disease was unusually severe, a special survey to determine distribution and damage was conducted by the Illinois State Natural History Survey under the leadership of L. R. Tehon. Since this was the most careful survey for this disease that has been made in any state for some time, it seems advisable to give here a synopsis of the report on this work that has been filed with this office. (L. R. Tehon. A summary of the occurrence of and losses from bunt in Illinois. Manuscript.)

> Rumors of severe infection and large losses of wheat due to bunt during past years led to a special survey for this disease in 1922 and 1923. As a result it was ascertained that Tilletia laevis was the prevalent causal fungus, no specimens whatever of Tilletia tritici having been found; that as a wheat disease in Illinois bunt is second only to leaf rust in importance; that in 1923 4.03% bunt occurred in 1140 acres inspected in 22 wheat counties; that the reduction in value (dockage) of wheat presented for sale in 1923, due to the presence of bunt, amounted to approximately $100,000, which, added to the field loss of 2,275,000 bushels, makes a total money loss for the state of about $2,375,000.
>
> The distribution of bunt in Illinois is given in Figs. 8 and 9. It has been found in exactly one-half of the counties of the state, but these counties represent two-thirds of the total land area.

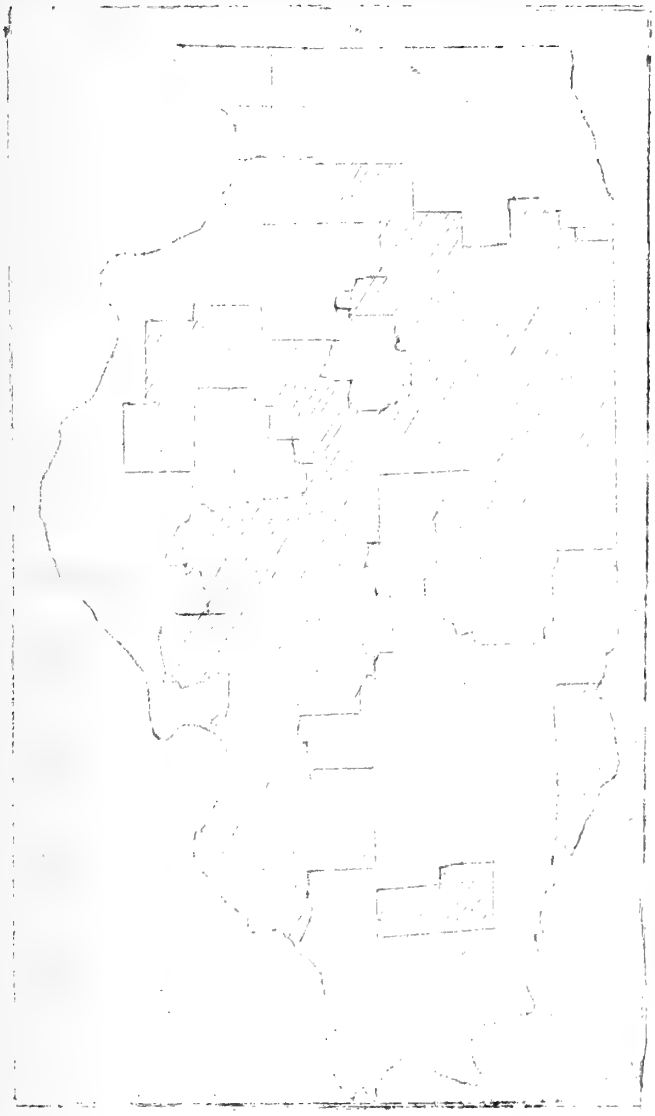

Fig. 8 Distribution of bunt in Illinois in 1923 as shown by inspections by Illinois State Natural History Survey.

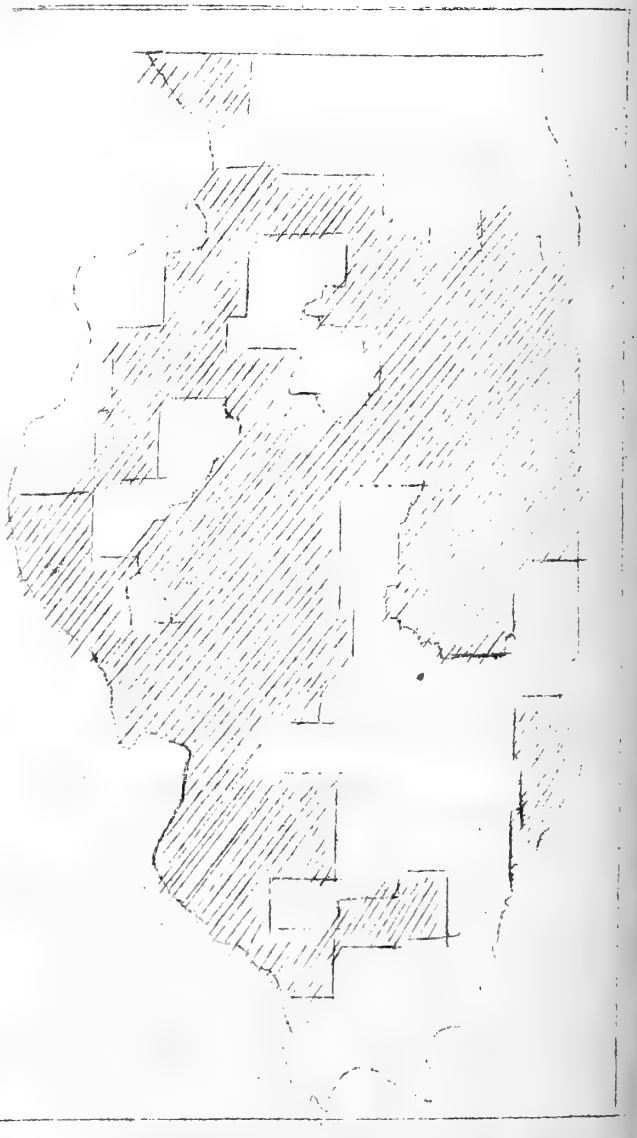

Fig. 9 Total known distribution of bunt in Illinois according to records of Illinois State Natural History Survey.

Bunt, however, has not taken its whole toll when it destroys the grain in the field. Excessive amounts in the threshed grain reduce its usefulness for certain purposes, and this is directly reflected in the application of a dockage upon the price of bunt-infested wheat when it is presented for sale. Data collected in 1923, as a result of about 2,500 letters to elevators, are shown in Table 40. Forty-three counties are represented, and information is presented on more than three million bushels which represent 1/20 of the crop.

Table 40. Cash dockage on bunt-infected wheat for the 1923 crop in Illinois.

County	Bushels marketed	Bushels smutted	Bushels smutted & docked	Dockage per bushel	Total dockage
Adams	67000	0			
Bureau	59000	0			
Champaign	127214	1150	150	$0.05	$ 7.50
Christian	60000	850	850	0.05	42.50
Clinton	100000	5000	5000	0.05	250.00
Coles	35000	450	450	0.05	22.50
Douglas	30000	2000	2000	0.10	200.00
Edgar	15000	0			
Ford	9250	2500	2500	0.01	25.00
Greene	40000	(?) 3000	3000	0.02	60.00
Grundy	40000	0			
Henry	6750	0			
Iroquois	43100	8180	180	0.03	5.40
			1750	0.10	175.00
Kankakee	100000	5360	5000	0.05	250.00
Kane	1300	0			
Knox	42000	2000	2000	0.04	80.00
La Salle	44582	1300+	500	0.03	15.00
			800	0.05	40.00
Livingston	132092	15821	1781	0.02	35.62
			1390	0.035	48.65
			150	0.075	11.25
			10000	0.04	400.00
Logan	146300	400	400	0.025	10.00
Macon	80000	0			
Mason	38490	0			
McDonough	61000	0			
McLean	123670	9250	2250	0.02	45.00
			7000	0.05	350.00
Mercer	3000	0			
Monroe	40000	2000	2000	0.10	200.00
Morgan	40000	5800	1800	total loss	---

WHEAT - Bunt

County	Bushels marketed	Bushels smutted	Bushels smutted & docked	Dockage per bushel	Total dockage
Montgomery	30000	423	423	$0.05	$ 21.15
Peoria	34848	650	500	0.01	5.00
Piatt	294000	25950	4000	0.03	120.00
			4200	0.035	147.00
			9500	0.05	475.00
			6000	0.07	420.00
			500	0.10	50.00
Putnam	40000	2000	2000	0.04	80.00
Randolph	11171	+	0		
Sangamon	149000	28200	2100	0.02	42.00
			7000	0.03	210.00
St. Clair	158100	10900	6200	0.11	682.00
			2200	0.06	132.00
Stark	3000	0			
Tazewell	150000	0			
Vermillion	60036	1000	1000	0.05	50.00
Wabash	130000	0			
Washington	17000	1000	500	0.03	15.00
			500	0.15	75.00
Warren	55500	8000	8000	0.045	360.00
Woodford	1350	0			
White	280000	0			
Whiteside	10000	0			
Will	93770	+	+	0.05	+
Total	3002523	143184 4.4%	105574 3.51%	Av.0.0488	$5157.57

It will be seen also that in many cases lightly smutted wheat has been received at elevators and mills without the application of dockage. Even then the majority of lightly smutted lots are passed by unnoticed.

Of the 3,002,523 bushels reported on, 143,184 bushels or 4.4% were sufficiently smutted to attract notice from purchasers, while 105,574 bushels or 3.51% were so badly smutted as to receive an average dockage of 4.88 cents.

The total dockage on the crop reported amounted to $5,157.57.

If the report may be taken as representing the crop of the state, of the 60,140,000 bushels produced 2,110,914 bushels would be docked at the rate of 4.88 cents per bushel, making a total cash dockage on the year's crop of about $100,000. This added to the estimated field loss would make a total money loss for the state of $2,375,000.

Considerable progress in the development of bunt-resistant varieties has been made during the past year. In the references below it will be seen that work is reported from four states, Michigan, Kansas, Washington and Oregon. One of the promising new varieties is "Ridit" developed at the Washington Experiment Station by E. F. Gaines, through the crossing of Turkey and Florence, the latter being a smut-resistant spring wheat introduced from Australia. Seven yield tests with this new wheat have given an average of 41.2 bushels an acre, while under the same tests the two leading winter wheats of Washington, Hybrid 128 and Turkey, produced 42.4 and 42.1 bushels per acre. Not more than 1/10% infection has been secured during 5 years of inoculation trials. The new variety has been distributed during the past year in one pound lots to hundreds of farmers.

Good results with the use of copper carbonate dusts and other new disinfectants have been secured by various workers during the year. (See section on seed treatment, page 248).

Recent literature (See also seed treatment section, page 248)

1. Clark, J. Allen. Ridit. In New varieties of wheat. Cereal Courier 15: 269. Sept. 30, 1923.
2. Coons, G. H. Varietal resistance of winter wheats to Tilletia laevis (Abstract) Phytopath 14: 38-39. Jan. 1924.
3. Gaines, E. F. Genetics of bunt resistance in wheat. Jour. Agr. Res. 23: 445-479. 1923.
4. Heald, F. D. and L. W. Boyle. Further notes on the relation of the spore load to the percent of stinking smut appearing in the crop. Phytopath. 13: 334-337. July 1923.
5. Johnston, C. O. Wheat bunt investigations in Kansas. (Abstract) Phytopath. 14: 37. Jan. 1924.
6. Munerati, O. Le basse temperature al momento della germinazione fanno sfuggire il grano all'attacco della carie? (Does low temperature at the time of germination enable wheat to escape bunt?) Atti R. Accad. Lincei Roma Redicónti Cl. Sci. Fis. Mat. e Nat. 32[1]: 285-289. 1923.
7. Stephens, D. E. Table showing bunt-resistance of winter-wheat varieties tested at the Sherman County Branch Station, Moro, Oregon. Cereal Courier 15: 332-334. Nov. 10, 1923.

Loose smut caused by Ustilago tritici (Pers.) Jens.

Conditions were favorable for the occurrence of an unusual amount of loose smut in some of the Middle Atlantic States and in Michigan and North Dakota. In the remainder of the country, however, the disease was of about normal prevalence.

Table 41. Collaborators' estimates of percentage loss from loose smut 1923.

Percent loss	States
5	North Carolina
3	Pennsylvania, Maryland, Virginia, West Virginia, Indiana, Arkansas
2	South Carolina, Alabama, North Dakota, Idaho.

Percent loss	States
1/2	Kentucky, Mississippi, Ohio, Illinois, Michigan, Wisconsin, Iowa, Missouri, Kansas, Utah.
trace - 1	New York, Delaware, Texas, Minnesota.
trace	Massachusetts, Tennessee, Louisiana, South Dakota, Nebraska, Arizona, Washington, California.

A number of States report differences in varietal susceptibility. In New York 132 wheat fields in 32 counties were surveyed for wheat diseases and the following table (Table 42) prepared by R. S. Kirby shows the percentage of loose smut infection by varieties.

Table 42. Amount of loose smut in various wheat varieties in New York, 1923.

Variety	Number of fields surveyed	Average percent of loose smut
Forward	3	0.
No. 6 (Gold Coin)	96	.03
Dawson	24	2.
Red Rock	10	2.35
Mixture (usually some No. 6 present)	43	.33
Honor	2	1.7
Fulcaster	2	1.7

In writing about this Kirby states, -

"Surveys for the past three years have indicated that No. 6 wheat was resistant but in no case was the evidence so convincing as in 1923. That the 96 fields of this variety surveyed should only have an average of 0.03 percent strongly indicates the resistance of this variety. Another variety of wheat which apparently is showing marked resistance to loose smut is Forward. This variety was developed by the Plant Breeding Department of Cornell University and first given out for farm plantings in 1921. Loose smut was not found in two fields composed of 44 acres surveyed in 1922 or in three fields composed of 45 acres surveyed in 1923. The only record of loose smut in this variety is of one head found by Dr. H. H. Love in the 1923 increase plots at Ithaca. Other varieties of wheat such as Dawson, Honor (a Dawson selection), Red Rock, and Fulcaster have about two percent of loose smut on the average and apparently are not as resistant as the first two varieties."

In Virginia, Fromme noted again the high percentage of infection in bearded wheats as compared with smooth wheats. In 16 fields of bearded wheat an average of 3.65% loose smut was estimated.

WHEAT - Loose smut

In Ohio, the Trumbull variety continued to show marked resistance, and in Illinois, where about 150 fields were examined, Fulcaster rarely showed more than 1/2% while Harvest Queen (Red Cross), Stoddard County Pride, and Fultz were heavily infected. Kota and Monad in North Dakota and Dicklow in Idaho were reported very susceptible.

No outstanding work on loose smut control has been reported during the year, nor have any papers of great significance been published.

Flag smut caused by Urocystis tritici Ecke.

During 1923 flag smut of wheat was found in one additional State - Kansas, and in nine new counties in the States of Illinois and Missouri. In Illinois the State Department of Agriculture found the disease occurring in the new counties of Macoupin, Greene, Scott, Logan, and Hancock, and in Missouri the Plant Disease Survey cooperating with the Missouri State College of Agriculture discovered flag smut for the first time in St. Charles, Warren, Platte and Buchanan Counties. In Kansas infestations were found by men from the Plant Disease Survey and State Agricultural College in four counties in the northeastern part of the state, namely, Wyandotte, Leavenworth, Atchison and Miami.

In the majority of fields examined by Federal men during the year, only traces of flag smut were found. Usually only a few diseased plants could be found in the fields, but several cases were noted where the infestation was high especially in spots. In one field in St. Louis County an average of several counts showed 31% affected plants, in a portion of the field. Three heavily infested fields were located in St. Charles County, Missouri; and in Leavenworth County, Kansas, one field of Harvest Queen showed 15% smut in one-quarter of a twenty-acre field, while on another farm in the same vicinity 50% affected plants was observed in one corner of a large field. This is probably the highest percentage of infection that has been observed occurring naturally thus far in this country.

As a result of conferences held at Granite City, Illinois, May 25, and at Springfield, Illinois, May 29, it was decided that in view of the now apparent wide distribution of flag smut the restrictive measures of disinfecting wheat at the separator and regulating the movement of wheat from infested areas, be removed, and that in place of these, educational measures recommending the planting of resistant varieties and seed treatment be substituted. The notice of quarantine for Illinois has as its only requirements the regulating of the movement of wheat straw and the confining of threshing machines to limited areas within or near the quarantined zones. The programs for Missouri and Kansas were modeled along similar lines.

Recent literature

Tisdale, W. H., G. H. Dungan and C. E. Leighty. Flag smut of wheat, with special reference to varietal resistance, Illinois Agr. Exp. Sta. Bul. 242: 511-538. April 1923.

Tisdale, W. H., G. H. Dungan and C. E. Leighty, Flag smut of wheat. U. S. Dept. Agr. Circ. 273: 1-6. 1923.

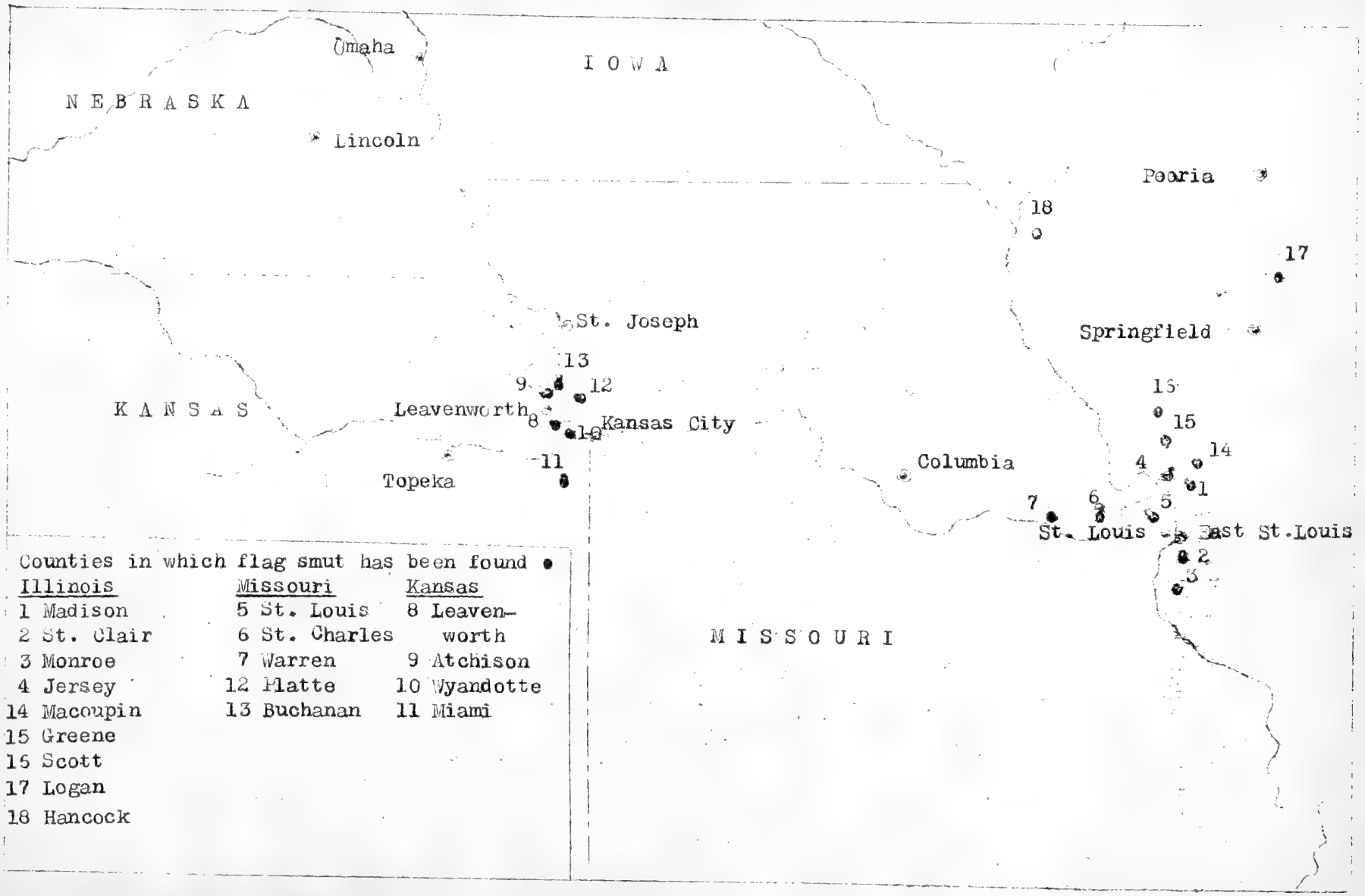

Figure 10. Distribution of flag smut of wheat in the United States by counties

WHEAT - Stem rust

Stem rust caused by Puccinia graminis Pers.
(Summary prepared by E. B. Lambert)

Distribution and losses:

In general the stem rust epidemic in 1923 was comparable to those of 1919 and 1920. It was, however, somewhat less severe. The rust was again much more serious in the spring wheat area than in the winter wheat regions. The relative prevalence of the rust, and the average percentage of loss for each state are indicated in Fig. 11. The losses in bushels for the more important spring wheat states are tabulated in Table 43.

Table 43. Losses from stem rust in spring wheat states, 1923, as reported by collaborators.

State	Estimated production, 1923. Bushels, (000 omitted)*	Estimated loss, 1923	
		Percent	Bushels (000 omitted)
Minnesota	20,785	15	3,118
North Dakota	58,660	12	7,039
South Dakota	26,906	10	2,691
Montana	52,486	18	9,447

*Production figures from Weather, Crops and Markets. December 29, 1923. p. 672.

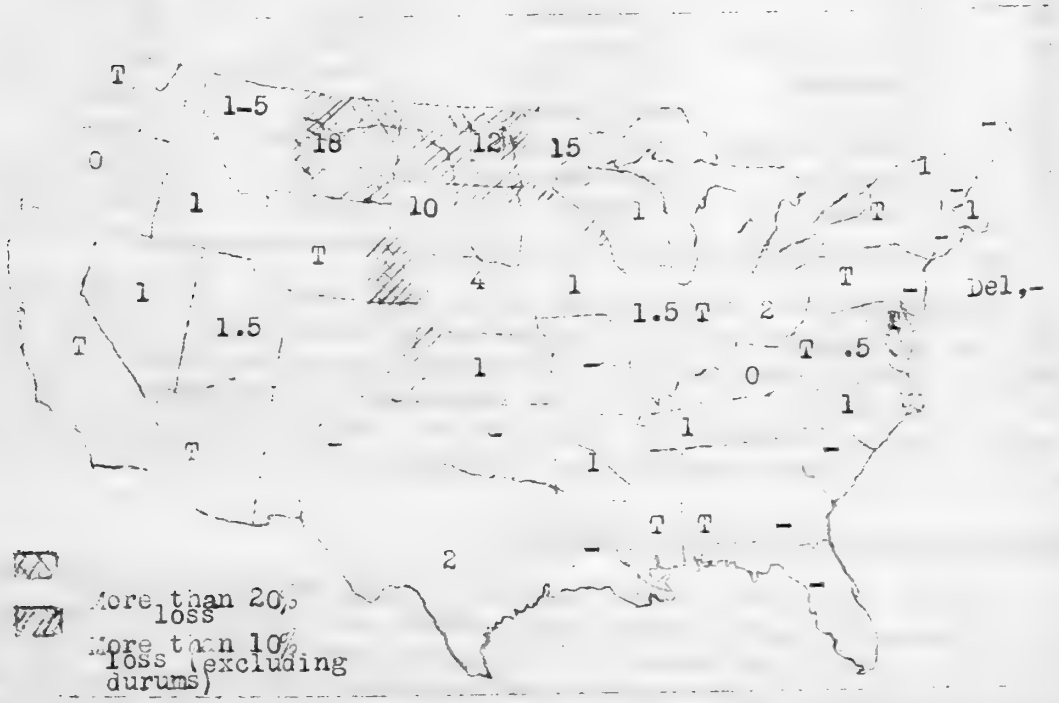

Fig. 11. Estimated average percentage loss from stem rust, according to collaborators, 1923.

WHEAT – Stem rust

Overwintering and first appearance:

Evidence of overwintering was obtained in Mexico and southern Texas only. Numerous observations were made early in the season. In so far as conclusions can be drawn from negative observations it would seem that the urediniospores did not overwinter in the Mississippi Valley north of central Texas.

The rust was first observed widespread in Texas and then increasingly farther north as the season progressed. Table 44 gives the first reports of primary field infection from the observations of state pathologists, members of the barberry eradication forces, and the men studying the epidemiology of stem rust under the direction of E. C. Stakman.

Table 44. First reports of stem rust not directly traceable to barberries – 1923.

Date	State	Town	County	Observer
...	Mexico	Piedras Negras		Ostrom
April 14	Texas	Castroville	Bexar	Butler
May 10	Oklahoma	Lawton	Comancho	Ostrom
May 26	Oklahoma	Stillwater	Payne	Ostrom
June 3	Kansas	–	Summers	Melchers
June 4	Illinois	–	Jackson	P. A. Young
June 4	Nebraska	–	Jefferson	Thiel
June 11	Indiana	–	Vanderburg	Frolik
June 15	Ohio	–	Preble	Frolik
June 20	Iowa	Atlantic	Cass	Butler
June 20	South Dakota	Yankton	Yankton	Thiel
June 22	Minnesota	St. Clair	Blue Earth	Christensen
June 23	Colorado	Cheyenne	Weld	Lungren
June 29	North Dakota	Christine	Richland	Mayoue
July 16	Wyoming	Laramie	Albany	Cotter
July 17	Montana	Plevna	Fallon	Christopher

Barberries were infected during the last week of April and the first week in May throughout the entire barberry eradication area with the exception of Montana, Wyoming and Colorado. The early appearance of rust on grain and grasses near barberries was especially noticeable in Wisconsin, Minnesota, and South Dakota. In these States fields were found infected near barberries from two to three weeks earlier than the appearance of the general epidemic.

Factors affecting the relative severity:

In the spring wheat area the rust was present in practically every field in Minnesota, North Dakota, South Dakota and Montana. The severity of the infection varied considerably, even in adjacent fields. This variation depended principally on the varietal susceptibility of the grain, and on the maturity and vigor of the stand when infected. Farther north in the Red River Valley at harvest time the rust was more severe, (see Fig. 11). This may be

explained on the basis of difference in the periods between the time of infection and the maturity of the wheat. This period was a week to ten days longer in the northern part of the valley than in the southern part. It is interesting to note in this connection that rust was severe in Manitoba, Canada. The conditions in this province are summarized in the Canadian Plant Disease Survey Report for 1923, as follows:

> "Throughout the province rust was very serious, causing about 50% loss of the wheat that was harvested, amounting to a reduction of 35,000,000 bushels, or in money value from 15 to 35 million dollars. These losses were greater this year than any year since 1916."

The infection in Montana was also reported as being the most severe since 1916.

In the winter wheat regions stem rust losses were small except in an area centered around northeastern Colorado. This area, as indicated in fig. 11, included a part of northeastern Colorado, northwestern Kansas, western Nebraska, and southeastern Wyoming. The heavy rust in that section seemed to be due to a delay in the maturity of the grain, resulting from a lack of snowfall during the previous winter and to drought during the early spring months. The average wheat field in that area did not mature until the second week in August, fully a month later than in eastern Nebraska. Rust was observed in this region on June 25. It therefore was able to increase locally for a month and a half before harvest.

In the remainder of the winter wheat region, a period of only two weeks existed between the time of the first widespread appearance of the rust and the harvest. Thus comparatively small losses resulted in the average wheat fields.

Barberry Eradication:

In the southeastern portion of the barberry eradication area throughout Michigan, Ohio, and Indiana, infections from barberries probably caused most of the severe damage. In the states of Illinois, Missouri, Kansas, Nebraska, Colorado, and Wyoming, and in the spring wheat area, it is probable that both wind-blown spores from points farther south, and spores from barberries were jointly responsible for the epidemic.

The epidemic this year was severe and widespread, especially in the spring wheat area. It is questionable whether the barberries found in the eradication area during the summer of 1923 constituted the only source of inoculum. A sufficient number of infected bushes and sprouts were found, however, to justify the conclusion that barberries must have been responsible for a considerable amount of early primary infection.

Furthermore the rust appeared generally in the fields of most localities fully a week later than in the last two seasons. Since weather conditions seemed ideal for early rust development, this delay may have been due to barberry eradication, and had the 5,000,000 bushes eradicated prior to 1923 still been in existence in the summer of 1923, the stem rust epidemic of 1923, which became very severe locally, might have become as generally severe and as tremendously destructive as the epidemics of 1904 and 1916.

The progress of barberry eradication in 1923 has been summarized by Dr. F. E. Kempton (4) as follows:

"On December 31, 1923, the original property-to-property survey had covered 662 counties out of 894 requiring survey. These 662 counties contained 543,984 square miles, or 75.4 percent of the 721,831 square miles in the 894 counties originally requiring survey. In the calendar year January 1 to December 31, 1923, approximately 190 1/2 counties, or 177,058 square miles, have been covered in the original survey, at an approximate cost of $2.20 a square mile. In addition, 42 1/2 counties, containing approximately 36,000 square miles, have been covered in a second complete survey, and 361 counties have been covered in resurvey. During the year a total of 4,005,342 bushes, seedlings, and sprouting bushes were found and 3,967,738 destroyed in all surveys. The record for the six years to December 31, 1923, shows the enormous total of 10,073,667 bushes, seedlings, and sprouting bushes found and 9,379,774 destroyed."

Varietal susceptibility:

The rust races affecting Kota and Kanredwheat were unusually prevalent this year. Comparatively heavy infection of these varieties was noticed repeatedly in the field and in nursery plots.

Several papers dealing with the genetics of the inheritance of rust resistance have recently appeared as a result of cooperative work at the Minnesota Experiment Station.

Aamodt (1) reports progress in obtaining the rust resistance of Kanred wheat in a variety with the spring habit of Marquis. He states,

"In the F_3 some hybrid families were homozygous for the spring habit of Marquis and for the rust resistance of the Kanred parent. ---- These facts further demonstrate that varieties of common wheat may be produced synthetically, which will be resistant to a large number of biologic forms of stem rust, Puccinia graminis-tritici."

Harrington and Aamodt (2) report the combination of different types of resistance from a Mindum - Pentad cross, as follows,

"With the varieties of wheat used, it was found possible to combine, in a single variety, resistance to two biologic forms of stem rust of wheat, when crosses were made which reacted reciprocally to these rust forms."

Hayes and Aamodt (3) combined the resistance of Marquis to rust Form XIX and the immunity of Kota to Form XXVII, "in 3 families out of a total of 372 families studied."

"In North Dakota wheat breeding and varietal experiments were studied at Fargo, Mandan, and Dickinson. Several promising F_5 rust-resistant strains of the Marquis x Kota cross, developed by L. R. Waldron, are being tested for the first time in field plats at Fargo and Dickinson. At Mandan a large population of F_3 and F_4 material of the Kota-Hard Federation cross was studied for rust and drought resistance. At Dickinson the most promising hybrids were strains of Marquis x Kanred and Kota x Kanred. One F_6 strain of Marquis x Kanred (1718 B 8-11) which ap-

pears to be the most promising, is being increased for growing in field plats and is being further selected. Nodak, a rust-resistant durum wheat, developed at Dickinson, is being further increased at the Dickinson Substation this year." (Cereal Courier 15: 201. August 20, 1923.

Literature:

Cited

1. Aamodt, Olaf S. The inheritance of growth habit and resistance to stem rust in a cross between two varieties of common wheat. Jour. Agr. Res. 24: 457-469. May 12, 1923.
2. Harrington, J. B., and O. S. Aamodt. The mode of inheritance of resistance to Puccinia graminis with relation to seed color in crosses between varieties of Durum wheat. Jour. Agr. Res. 24: 979-996. June 23, 1923.
3. Hayes, H. K., and O. S. Aamodt. A study of rust resistance in a cross between Marquis and Kota wheats. Jour. Agr. Res. 24: 997-1012. June 23, 1923.
4. Kempton, F. E. Progress of barberry eradication, 1923. Cereal Courier 16: 19-30. Jan. 31, 1924.

Not cited

Beauverie, J. Sur les rapports existants entre le développement des rouilles du blé et le climat. (The relation between climate and development of wheat rusts) Compt. Rend. Acad. Sci. Paris 176: 529-531. 1923.

Hansen, H. R. Severity of attacks of black stem-rust in Denmark. 1844-1921. Phytopath. 13: 404-407. 1923.

Hurd, A. M. Hydrogen-ion concentration and varietal resistance of wheat to stem rust and other diseases. Jour. Agr. Res. 23: 373-386. 1923.

Levine, M. N. A statistical study of the comparative morphology of biologic forms of Puccinia graminis. Jour. Agr. Res. 24: 539-568. May 19, 1923.

Mehta, K. C. Observations and experiments on cereal rusts in the neighborhood of Cambridge, with special references to their annual recurrence. Trans. Brit. Mycol. Soc. 8: 142-176. March 1923.

Peltier, G. L. A study of the environmental conditions influencing the development of stem rust in the absence of an alternate host. II. Infection studies with Puccinia graminis tritici form III and form IX. Nebraska Agr. Exp. Sta. Res. Bul. 25: 52. 1923.

Stakman, E. C. Barberry eradication prevents black rust in western Europe. U. S. Dept. Agr., Dept. Circ. 269: 1-15. 1923.

Waterhouse, W. L. Some aspects of the wheat rust problem. Agr. Gaz. New South Wales 34: 381-387. 1923.

Leaf rust caused by Puccinia triticina Erikss.

The following summary by E. B. Mains is in accord with the information that has been received by the Survey.

WHEAT - Leaf rust

"Leaf rust has been less severe this season than in the previous two years. Although wheat varieties were late in maturing and the season has been very favorable for the disease, leaf rust was late in developing. In the middle of May very little rust was noted in Tennessee, Kentucky, and Indiana. However, by June 11 susceptible varieties at Knoxville, Tennessee, showed an infection of 100 percent. Certain varieties were beginning to ripen at this time. In most places rust evidently reached its maximum intensity only a short time before harvest. Consequently the loss from it is much less this year than usual. Apparently this is due in part to the more or less open winter characterized by such extreme fluctuations in temperature as to reduce very materially the amount of surviving leaf rust on wheat in the central portion of the eastern United States."

Practically all states east of the Mississippi reported much less leaf rust than last year, when the disease was epiphytotic over that area. In the cotton belt the estimated losses ranged from 1 to 5% (average 3%) in comparison with 1 to 15% (average 6%) in 1922. In the Atlantic States from Virginia northward about 1%, and in the Ohio Valley States from 1 to 4% reduction in yield is estimated (4% and 9% respectively in 1922). The Lake States report only a trace of damage, whereas in 1922 1% was estimated. West of the Mississippi, on the other hand, in Missouri, Iowa, Kansas, Nebraska, and the Dakotas, where leaf rust is ordinarily not so important, it was more prevalent than in 1922. In this group of States a reduction in yield of about 1% probably occurred.

Table 45. Dates of earliest recorded appearance of leaf rust, 1923.

Date	Place	Date	Place
March 8 (a single new pustule on volunteer wheat in a clover field)	Lexington, Ky.	May 14	Arlington, Va.
		May 31	Seaford, Del.
		June	Brookings, S. D.
		June 5	Ramsey Co., Minn.
April	Baton Rouge, La.	June 5	Lafayette, Ind.
April 15	Donalds, S. C.	July 5	Marion Co., Ohio.
April 17	Oktibbeha Co., Miss.	July	Ft. Collins, Colo.
May 2	Ithaca, N. Y.		

Many collaborators mention the fact that the rust was later in appearing than usual and that it was largely because of this that the damage was less than usual. The delay has been attributed to unfavorable conditions for overwintering and to the cool weather of spring and early summer.

That progress is being made in the selection of resistant varieties is shown by the following note by H. S. Jackson and E. B. Mains (Cereal Courier 15: 206, 1923).

"Varieties at Washington, D. C., Knoxville, Tenn., Experiment, Ga., La Fayette, Ind., and Madison, Wis., showed considerable variation as to susceptibility. As a group, the durums and emmers showed outstanding resistance to leaf rust. Among the bread wheats, Kanred,

several strains of Turkey, and Beloglina were fairly resistant. Malakoff (C. I. No. 4898), Imperial Amber (C. I. No. 4860), Democrat (C. I. No. 3384), Norka (C. I. No. 4377), and several unnamed spring wheats showed high resistance in some plantings and considerable susceptibility in others, apparently correlating with the distribution of the strains of leaf rust."

Literature:

1. Valleau, W. D. The oversummering of leaf rust of cereals in Kentucky. Phytopath. 13: 338-340. 1923.

Stripe rust caused by Puccinia glumarum (Schm.) Erikss. & Henn.

Slight amounts of stripe rust on wheat were reported from Idaho, Washington and California, but in no case was more than a trace of damage reported. Hungerford reported more of this disease than the average and more than in 1922, when it was very scarce.

An interesting and probably significant fact in connection with this disease is the discovery by E. C. Stakman of Puccinia glumarum in Mexico. During the first part of April he observed this rust occurring abundantly in Mexican wheat fields as far north as Saltillo in the state of Coahuila, which is about 180 miles southwest of the Texas border at Laredo. It will be seen that this Mexican infection is a possible source from which stripe rust may be introduced into the wheat fields of Eastern United States.

Two important contributions concerning this disease in this country have appeared during 1923.

1. Hungerford, C. W. Studies on the life history of stripe rust, Puccinia glumarum (Schm.) Erikss. & Henn. Jour. Agr. Res. 24: 607-620. May 19, 1923.
2. Hungerford, C. W., and C. E. Owens. Specialized varieties of Puccinia glumarum, and hosts for variety tritici. Jour. Agr. Res. 25: 363-401. Sept. 1923.

Fusarium blight (scab) caused by Gibberella saubinetii (Mont.) Sacc.

Less Fusarium blight (scab) of wheat than last year occurred in the Atlantic Coast States and in most of the Lake States, but more of the disease than in 1922 was reported from Tennessee, Arkansas, Indiana, Illinois, Missouri, Iowa, Nebraska, Minnesota, and South Dakota. It was not reported from a number of the southern States nor from States west of the 100th meridian.

Losses were reported as shown in table 46. It will be noted that considerable damage occurred in part of the spring wheat area. Concerning the losses in South Dakota, A. T. Evans says,

"Ten percent seems high, but I feel confident it did that much damage everywhere. It did an immense amount of damage, many fields not being cut. Farmers thought rust did it."

Table 46. Estimated percentage reduction in yield of wheat due to Fusarium blight (scab), 1923.

Percent	State
10	South Dakota
5	Tennessee
4	Iowa
2	Pennsylvania, Illinois, Missouri
1	Maryland, West Virginia, North Carolina, North Dakota, Kentucky, Arkansas.
Trace	New York, Delaware, Virginia, Ohio, Indiana, Michigan, Wisconsin, Minnesota Nebraska, Alabama, Mississippi, Texas.

Table 47. Dates of earliest report of wheat scab, 1923.

Date	Place
May 20	Madison County, Illinois
June 23	Batavia, New York
June 24	Panola County, Mississippi
June 27	Madison, Wisconsin
June 28	McLeod, Minnesota
July -	Brookings, South Dakota
July 8	Fargo, North Dakota

The week ending June 19 was wet in parts of South Dakota, Nebraska, Minnesota, Iowa, Illinois, and Missouri, as was also the week ending July 3. It is not unlikely that the losses in these states are correlated with these rainy periods.

Collaborators in Kentucky made counts in about 1600 acres of wheat in 15 counties and found an average of about 20% infected heads. Although scab was most prevalent in wheat fields following corn in rotation, the opinion is expressed by the Kentucky collaborators that this may be due to deficient fertility rather than to a greater abundance of the organism.

Notes on varietal susceptibility:

Kentucky: Later varieties in some variety tests were much freer from infection, apparently escaping. (Valleau)

Illinois: Affected varieties have been Red Wave, Fultz, New Columbia, Fulcaster, Turkey 10-110, Turkey Red, Marquis, and Red Cross. Dungan reports none on Illinois No. 1, but 40% on White Australian spring varieties. (Tehon)

WHEAT - Fusarium blight

Minnesota: Marquis extremely susceptible, Preston and Haynes Blue Stem resistant. Common on winter wheat, especially Mintarki. (Sect. Plant Path.)

North Dakota: Early maturing varieties, such as Prelude, more commonly affected than later, common and durum wheats, this year. (Weniger)

South Dakota: Especially bad on durum wheat. (Evans)

References: (See also seedling blight, page 271)

1. Dickson, J. G. Influence of soil temperature and moisture on the development of the seedling blight of wheat and corn caused by Gibberella saubinetii. Jour. Agr. Res. 23: 837-870. 1923.
2. Dickson, James G. Sophia H. Eckerson, and Karl P. Link. Studies on predisposition of wheat and corn to seedling blight caused by Gibberella saubinetii. (Abstract) Phytopath. 14: 34. Jan. 1924.

Black chaff caused by Bacterium translucens undulosum S. J. & R.

Only traces of black chaff were reported from Arkansas, Wisconsin, Minnesota, Iowa, Montana, Colorado, and Idaho, but in the tier of states from Oklahoma and Kansas northward to the Dakotas and even into Manitoba and Saskatchewan considerably more black chaff than usual was reported. According to W. Weniger, North Dakota experienced its first real epidemic of black chaff. It was general over the state infecting the leaves, stems, and heads, and in some instances the heads were prevented from emerging. As high as 50% infected heads were observed in some fields and 20% loss was estimated in some cases. The average loss for North Dakota is placed at 5% or about 3,000,000 bushels. In South Dakota, A. T. Evans estimated about 1% reduction in yield. In Nebraska, G. L. Peltier, and in Kansas, L. E. Melchers reported the disease as very general throughout their states, but in neither state was it thought to be causing much loss.

R. O. Cromwell reported an abundance of the disease in North Dakota, southern Manitoba, southeastern Saskatchewan, Nebraska, south central Kansas, and north central Oklahoma, and makes the suggestion that this disease was possibly more serious than was generally supposed.

In all of these states farmers commonly confused this disease with the black stage of stem rust.

The variety Kota was mentioned as susceptible in Minnesota and North Dakota, Marquis in Minnesota, Kanred in Nebraska, and several of the amber durum wheats in North Dakota.

Take-all caused by Ophiobolus cariceti (Berk. & Br.) Sacc. (O. graminis Sacc.)

Ophiobolus on wheat was found in the following new localities in 1923, and during the year it was ascertained that the organism was collected in Maryland in 1920.

North Carolina -	Lincolnton,	Lincoln Co.
	Statesville,	Iredell Co.
	Concord,	Cabarrus Co.
	Taylorsville,	Alexander Co.
Tennessee -	Knoxville,	Knox Co. (May 21)
Kansas -	Manhattan,	Riley Co.
Oregon	Oregon City	Clackamas Co.
California -	Davis,	Yolo Co.

Saskatchewan, Canada - One field in northern part of province.
(Fraser, W. P. in - Survey of the prevalence of plant diseases in the Dominion of Canada, 1923. Fourth Annual Report.)

These occurrences add a province of the Dominion of Canada and three new states - North Carolina, Tennessee, and California, to the list of those from which the true take-all has been authentically reported. The other states are, New York, Maryland, Virginia, Arkansas, Indiana, Kansas, Oregon, and Washington. In summing up the information on the distribution of the disease, H. H. McKinney says -

"Take-all is now known to occur in all of the wheat regions except the spring wheat belt. This may be explained on the basis of nonintroduction or possibly on account of climatic factors which may not wholly favor the parasite or the disease. Experimental work shows that spring wheats are susceptible to infection, thus eliminating a varietal explanation.

"It should be noted that although the total area involved in the take-all infested areas is not large, the disease does occur in the most strategic locations from the standpoint of further distribution and future economic importance. It is established in the center of the hard winter wheat belt and it is gradually spreading.

"Perithecial development varies considerably in different localities and during different seasons. Perithecia have been found to occur very sparsely in Kansas during the period that take-all has been observed in the state. In the vicinity of Corvallis, Oregon, fruiting bodies developed more abundantly in 1923 than was the case during 1921 and 1922 in adjacent fields. Perithecia developed very abundantly in North Carolina in 1923."

In New York 386 cereal fields in thirty-five counties were examined during the season, and concerning take-all R. S. Kirby, who made most of the inspections, reports in part as follows:

"Take-all in 1923 was found in 42 of the 182 winter wheat fields surveyed. These forty-two infested fields were located in eleven counties as shown in Table 48.

"During the 1923 survey, the area observed to be infested with take-all was smaller than that observed to be infested during the 1921 and 1922 surveys. This was shown by the fact that a total of

eighteen counties were known to be infested in the two years surveys of 1921 and 1922, but a resurvey of the same area in 1923 resulted in the finding of take-all in only the eleven counties nearest to the apparent center of the infested area.

Table 48. Counties and number of wheat fields in which take-all was found in New York during 1923.

County	Number of fields in which take-all was found	Total number of fields surveyed
Cayuga	16	21
Cortland	1	1
Genesee	5	15
Livingston	1	8
Monroe	3	8
Onondaga	1	2
Ontario	4	4
Oswego	1	3
Seneca	1	7
Tompkins	2	25
Wayne	7	8
Total 11 counties	42	102

"The average amount of plant killing or loss due to take-all in the infested area in 1923 was figured to be three-tenths of one percent. This is a marked reduction from the one and one-tenth percent found in 1922 and the two percent of killing occurring in 1921.

"The loss in 1923 was by far the least which has occurred during the past three years. This lack of severity of the disease was shown by the facts that the disease first appeared nearly two weeks later than in 1922, and that in 1923 the later infection caused less dwarfing of the plants with resulting greater difficulty in finding them. These marked differences in the amount of loss and killing apparently are due to the climatic factors. Thus in 1923 when there was the smallest loss there was a very late cool, dry spring and the same condition remained until harvest time. In contrast to the 1923 conditions, the spring and summer of 1922 until harvest time were wet and cool. Under these conditions the affected plants died earlier and the amount of stunting was somewhat increased over 1923. Further in contrast to the conditions in 1922 and 1923, in 1921 the exceptionally early wet spring was followed by a very dry summer accompanied by a very early killing of the infested wheat plants with the resulting extreme stunting and loss. Therefore weather conditions seem to be the large factor in determining the amount of loss. The weather conditions which seem to favor the disease are: early wet springs which are followed by dry, hot weather from the period of jointing until harvest. The early, wet springs seem to be less serious if the weather remains wet and cool until harvest time. Late, dry springs such as occurred in 1923

seem to be very unfavorable to the disease as shown by the reduction of this disease in the fields and also in plots here at Ithaca where there was considerably less disease present in wheat planted and inoculated in the same manner both years.

"A very striking example of the result of continuous wheat cropping was observed during the 1923 survey. In 1922 Dr. M. F. Barrus and the writer examined a ten acre wheat field just north of Auburn, N. Y., and found that there was only a trace of infection present. This year the same field was planted to wheat and an examination showed that there were at least ten percent of infected plants. So far as could be observed it still seems probable that the best method for the control of take-all in winter wheat is a four or five year rotation which includes one or two such crops as potatoes or corn where clean culture is practiced.

"From observations made during the past two years, it seems important that all wheat should be thoroughly cleaned before planting, as there is strong evidence that when the wheat is threshed by the common methods a small amount of inoculum which may result in a trace of infection in the next crop is carried with the seed as bits of infected straw."

References:

1. Mackie, W. W. Foot-rot or Ophiobolus in California. Phytopath. 13: 561-562. Dec. 1923.
2. Melchers, L. E. and M. C. Sewell. The rate of spread of wheat foot-rot in tillage plots in Kansas. (Abstract) Phytopath. 14: 41. Jan. 1924.
3. Rosen, H. H. and J. A. Elliott. Pathogenicity of Ophiobolus cariceti in its relationship to weakened plants. Jour. Agr. Res. 25: 351-358. Aug. 25, 1923.

Rosette (cause undetermined)

"This disease recurred in the experimental plats at Granite City, Illinois, in 1923, and the infestation was very severe in all plats sown with susceptible varieties. The disease was not severe in the experimental plats located at Wanatah, Indiana. Infested soils from Granite City and Wanatah gave a very high percentage of rosetted plants at Madison, Wisconsin. The cause of wheat rosette is still unknown. Inoculation experiments with Helminthosporium sativum have not yet produced rosette in the susceptible varieties. Additional experiments involving different methods are now being carried out in connection with this point.

"The mosaic-like leaf mottling associated with rosette recurred this year. This manifestation has a wider host range than rosette, however. The writer, in company with Dr. G. L. Peltier, inspected the wheat variety plats on the Nebraska Experiment Station farm at Lincoln and a considerable amount of leaf mottling was found. This mottling is indistinguishable from that occurring in the Granite City, Illinois, region. No varieties known to be susceptible to

rosette were growing in the plats so it was not possible to make observations on this manifestation." (H.H. McKinney)

The wheat in two fields in Illinois, one in Cass County and the other in Logan County, was reported infected by Dungan and Tehon. This is probably a fewer number of infestations in Illinois than has been reported any year since the disease was first discovered in 1919.

Literature:

1. McKinney, H. H. Investigations of the rosette disease of wheat and its control. Jour. Agr. Res. 23: 771-800. 1923
2. McKinney, H. H. and W. H. Larrimer. Symptoms of wheat rosette compared with those produced by certain insects. U. S. Dept. Agr. Bul. 1137: 1-8. 1923.
3. Webb, R. W., C. E. Leighty, G. H. Dungan, and J. B. Kendrick. Varietal resistance in winter wheat to the rosette disease. Jour. Agr. Res. 26: 261-270. Nov. 1923.

Other foot and root rots

1. Wojnowicia graminis (McAlp.) Sacc. & D. Sacc. H. H. McKinney has summarized the situation with regard to this fungus: -

"This fungus has been found in several other footrot infested areas associated with and independent from Ophiobolus graminis. Inoculation studies show that the fungus is a parasite, producing symptoms on seedlings which bear certain resemblances to the symptoms produced by Ophiobolus graminis and Helminthosporium sativum. It is not known just how aggressive Wojnowicia graminis may be under various field conditions."

Concerning the fungus in New York, R. S. Kirby reports as follows -

"This pathogene on wheat was first observed at Ithaca on May 23, at which time mature pycnidiospores had been formed. During the survey the disease was found in five counties, four of which are new locations. It was found in two counties quite remote from the take-all infested area which shows that it is not always associated with it. This pathogene was also observed on Agropyron repens at Ithaca on July 19. The infected grass was growing in drill rows with diseased wheat."

2. Sclerotium rhizodes Auersw. This fungus was reported to the Survey from the state of Washington on July 7 for the first time. The report was later substantiated by specimens. Regarding it F. D. Heald says, -

"Large patches in a field of winter wheat at Chelan were killed by Sclerotium rhizodes, which produced an abundance of sclerotia in the dead leaves."

WHEAT - Foot and root rots

More information about the occurrence in Idaho in 1922 has recently been given. (Hungerford, Chas. W. A serious disease of wheat caused by Sclerotium rhizodes in Idaho. Phytopath. 13: 463-464. Oct. 1923.)

3. An undetermined foot rot was reported occurring again in Spokane County, Washington, by F. D. Heald. It was first noticed this year about May 20 at Freeman, in Spokane County. Wojnowicia graminis has been found associated with this disease by members of the Office of Cereal Investigations.

4. A foot rot of wheat in Oklahoma has been found to be associated with a fungus of the Helminthosporium or Brachysporium type. (McKinney, H. H. An undescribed inperfect fungus associated with wheat foot rot in Oklahoma. (Abstract) Phytopath. 14: 34. Jan. 1924)

5. Root rots associated with Fusaria were reported from New York, Minnesota, North Dakota and Oregon. In New York they were of only slight importance as they were never found affecting more than a few plants in a field. In Minnesota, however, where seedling blight was prevalent, it was rated as of considerable importance, causing a loss of perhaps one-half of one percent.

References:

1. Rose, Jessie P. Fusarium culmorum in Oregon, its varieties and strains that cause disease of cereals and grasses. (Abstract) Phytopath. 14: 49. Jan. 1924.
2. Rose, Jessie P. Fusarium culmorum var. leteius, a cause of disease in cereals and grasses. (Abstract) Phytopath. 14: 50. Jan. 1924.

6. Seedling blight caused by Helminthosporium sativum P. K. & B. and other species of Helminthosporium. New York, Minnesota, Iowa, Kansas, and North Dakota reported this disease.

New York: This disease apparently caused the greatest damage to the wheat before it began to joint. During May the disease resulted in some killing in nearly all fields observed but after the wheat began to joint the disease, while nearly always present, did not seem to cause any appreciable damage. (R. S. Kirby)

Minnesota: Common throughout the state but only slight infections on heavy soils. On sandy soil, on the other hand, much damage occurred, the yield being decreased 25-50%. (Sect. Plant Path.)

Reference:

McKinney, H. H. Influence of soil temperature and moisture on infection of wheat seedlings by Helminthosporium sativum. Jour. Agr. Res. 26: 195-218. Nov. 1923.

WHEAT - Nematode

Nematode - Tylenchus tritici (Stein.) Bast.

Only a few slight infestations of wheat nematode were reported from Virginia, West Virginia, and North Carolina this year. No new occurrences were recorded.

Reference:

Goodey, T. Quiescence and reviviscence in nematodes, with special reference to Tylenchus tritici and Tylenchus dipsaci. Jour. Helminth. 1: 47-52. May, 1923.

Anthracnose caused by Colletotrichum cereale Manns

New York, Pennsylvania, Maryland, Virginia, Kentucky, Ohio, Indiana, and Illinois reported this disease on wheat. R. C. Thomas, in Ohio, states that the losses were much less than in 1922, and were most pronounced in the southern and western part of the state. C. T. Gregory reports the disease as widespread in Indiana and serious in Posey County. In some wheat fields, areas of dead plants up to 30 feet in diameter were found. The use of old wheat straw as a winter mulch is thought to be favorable. L. R. Tehon, of Illinois, writes that for the first time, at least in recent years, anthracnose was serious in the state as a whole and in some localities it was the most important wheat disease.

Glume blotch caused by Septoria nodorum Berk.

The majority of the states east of the Great Plains Region report some of this disease, but only along the southern border of the winter wheat belt was appreciable damage reported. It is still a question as to how much loss this disease is capable of causing, it being maintained by some that Septoria infection of the glumes does not decrease the yield. This may be true under certain conditions, but does it hold for all conditions, and what are the influencing factors? That some collaborators consider the disease of economic importance is shown by the following estimates of losses in 1923: North Carolina and Arkansas each 4%, Kentucky and Alabama each 1%, Kansas 0.5%, and New York 0.3%.

Speckled leaf blotch caused by Septoria tritici Desm.

Judging from the reports sent in, this disease of wheat leaves was more prevalent than usual in the corn belt states from Indiana westward to Nebraska and Kansas. Reports from Arkansas and Georgia also indicate more than usual, but in the other states it was not particularly noticeable.

This disease is usually one of the first of the season to put in an appearance. It often affects the wheat in the rosette stage, commencing with the lower leaves and progressing upward onto the culm leaves.

Ergot caused by Claviceps purpurea (Fr.) Tul.

Twenty-one collaborators in as many widely scattered states reported that

ergot had not been found on wheat in 1923. In New York, where a considerable number of wheat fields were examined for diseases, a bare trace was found. In Minnesota also a trace was reported, and in North Dakota, where on occasion ergot has been serious on durum wheat, much less was reported than last year or the average year. W. Weniger makes the following statement -

> "The last epidemic (in North Dakota) occurred in 1921, when many lots of threshed samples of amber durum from the Red River Valley contained 10% and more of ergot bodies."

Powdery mildew caused by Erysiphe graminis DC.

Slight amounts of powdery mildew occurred in many of the humid eastern states. The only losses that are reported are from New York and Maryland, where one-half percent reduction in yield is estimated.

Literature:

Mains, E. B. Wheat resistant to mildew, Erysiphe graminis. (Abstract) Phytopath. 14: 48. Jan. 1924.

Downy mildew caused by Sclerospora macrospora Sacc.

This wheat disease, hitherto reported in this country only from Kentucky, Tennessee, and California, was found in 1923 for the first time in Delaware. On June 25, J. F. Adams of the Delaware Experiment Station noted the disease and collected specimens of affected Red Rock and Miracle wheat from a low area in the experimental plots at Newark. The seed of the former variety came from the Pennsylvania Agricultural Experiment Station and that of Miracle from Landisville, Pennsylvania. Plants of Pennsylvania 44 and Leap's Prolific in adjacent plots showed no downy mildew. Specimens which were submitted to Washington for identification are on file in the Pathological Collections, of the Bureau of Plant Industry.

Other diseases.

Bacterium atrofaciens McCulloch, causing basal glume rot of wheat was reported from Nebraska and Montana in 1923.

Bacterium alboprecipitans Rosen. According to H. R. Rosen (A bacterial disease of foxtail (Chaetochloa lutescens). Ann. Missouri Bot. Gard. 9: 333-402. Nov. 1922) this organism has never been found occurring naturally on wheat, but infections have been produced artificially by Rosen on at least twenty-seven wheat varieties.

Stripe (undet.) was reported from nine counties in New York. It was confined almost wholly to the variety No. 6, according to Kirby, and was first observed June 14. This is a leaf disease that has been reported from New York almost annually for several years now, but which has not been recognized definitely in many of the other states.

Black point associated with Helminthosporium sativum occurred to some extent in the Red River Valley of North Dakota, according to W. Weniger.

RYE

Stem rust caused by Puccinia graminis Pers.

During the season of 1923 stem rust caused only slight loss in rye. Few states reported more than a trace. Ohio reported a loss of 2 percent, Massachusetts, Connecticut, and South Dakota 1 percent, North Dakota .5 percent, New York and Wisconsin .1 percent. A trace of loss was reported from Maryland, West Virginia, Georgia, Indiana, Illinois, Michigan, Minnesota, Iowa, Nebraska, Kansas, Colorado, Texas, Idaho, Washington, and Oregon.

The worst damage occurred in Ohio, where the disease was severe in local areas of the southern and eastern parts of the state. Primary infection was traced to barberries in some cases in New York and Minnesota.

Leaf rust caused by Puccinia dispersa Eriks.

Rye leaf rust as usual occurred widely over the United States. Like the leaf rust of wheat it was less severe than in 1922 in the majority of the states east of the Mississippi River and, owing to climatic conditions, was late in developing.

This is regarded as the most serious rye disease in many states, but for the country as a whole it is probably secondary to stem rust. In some states it was less important than anthracnose and in others less serious than ergot.

Table 49. Estimated losses from leaf rust of rye, according to collaborators, 1923.

Estimated loss (percent)	States
6	Massachusetts
3	Arkansas, Ohio
1	Connecticut, New York, Maryland, Virginia, Georgia, Illinois
0.5	South Carolina, Alabama
Trace	West Virginia, Kentucky, Tennessee, Mississippi, Louisiana, Indiana, Michigan, Wisconsin, Minnesota, Iowa, North Dakota, Kansas.

The following statements relating to overwintering may be of significance:

New York: Overwintered at Ithaca as open uredinia, and during May and early June increased from a trace to an average of 10% infection. (Kirby)

Delaware: Heaviest infection on volunteer growth. (Adams)

Kentucky: Very little overwintered on volunteer plants heavily rusted in the fall. Plants carefully observed all winter showed none in the spring. (Valleau)

Minnesota: Winter rye in southern counties infected later than in more northern part of state. Not common in south until latter part of June. (Sect. Plant Path.)

Table 50. Dates of earliest observation, 1923.

Date	Location	County	State
April	Baton Rouge	East Baton Rouge	Louisiana
April 26		Coahoma	Mississippi
April 26	Columbia	Brown	South Carolina
May 2	Ithaca	Tompkins	New York
May 5	Houston	Kent	Delaware
May 23		Chisago	Minnesota
June	Riley	Riley	Kansas
June	Fort Collins	Larimer	Colorado
June 4		Jackson	Illinois
July 1	Washington	Litchfield	Connecticut

Reference:

Mains, E. B. Resistance in rye to leaf rust, Puccinia dispersa Erikss. Jour. Agr. Res. 25: 243-252. Aug. 1923.

Anthracnose caused by Colletotrichum cereale Manns.

New York, Virginia, South Carolina, and Mississippi report more anthracnose than in the average year while Ohio, Wisconsin, and Minnesota report the same as usual. It was not observed in the Dakotas. In New York, Virginia, Mississippi, and Ohio this was regarded as the most serious rye disease of the year, causing 1% loss in New York and 10% and 15% in Mississippi and Ohio respectively. South Carolina losses were estimated at 2%.

Table 51. Dates of earliest observation, 1923.

Date	Location	County	State
April 24		Oktibbeha	Mississippi
April 26	Columbia	Richland	South Carolina
June 2	Ithaca	Tompkins	New York
July 10	Waupaca	Waupaca	Wisconsin
July 10		Moore	Minnesota

Ergot caused by Claviceps purpurea (Fr.) Tul.

The only state reporting more ergot than usual or more than last year was Iowa. In the other states, especially those important in rye production such as North Dakota, Michigan, Minnesota, and Wisconsin, there was about the average, or perhaps less than the average amount. Comparatively dry weather at blossoming is mentioned by a number of collaborators. The losses from ergot for the country as a whole were very slight, being estimated at less than one percent in all states. Probably the disease did as much damage in Iowa and the Dakotas as anywhere. Occurrence on volunteer rye was mentioned specifically by a number of collaborators.

RYE - Stem smut

Stem smut caused by Urocystis occulta (Wallr.) Rab.

No new facts about the geographical distribution of this disease were obtained during the year except that it was reported for the first time from Ashland County in northern Wisconsin. According to R. E. Vaughan this is the first report from this section of the state. In general the disease was of only slight importance, although there are reports from several states of severe localized infestations. Thus, one field near Bridgewater, Virginia, showed 10% loss; infections of 20% were seen in two fields in Hancock and Christian counties, Illinois; E. A. Bessey reported a field near Battle Creek, Michigan with 10%; and as high as 20% infection was observed in Minnesota.

Regarding the importance of this disease in New York, R. S. Kirby says,

> "The stem smut of rye, while not the most destructive disease of this crop throughout the entire state where it only caused .08 percent loss, nevertheless is an important disease of rye in the Hudson Valley. It is very likely that a careful survey of the principal rye growing region of New York State made before the plants head would reveal the fact that nearly one percent of the plants are infected with this smut."

Head smut caused by Ustilago tritici (Pers.) Jens.

This disease was collected in Kentucky for the first time and a single head was found June 7 in Cottonwood County, Minnesota. The Kentucky collections, a part of which were sent to Washington, were made by W. D. Valleau at Harrodsburg, Mercer County, about May 22. He found some specimens in a field of wheat that showed between 17 and 20% loose smut, and others were obtained from the edge of a field of rye more than a mile away from the wheat field.

Fusarium blight (scab) caused by Gibberella saubinetii (Mont.) Sacc.

Traces of this disease were reported only from New York, Ohio, Illinois, Wisconsin, Minnesota, Iowa, and North Dakota, and several of these states report less than last year. Dry weather at the critical periods is given as the cause for the reduced amount.

Other diseases

Bunt caused by Tilletia tritici (Bjerk.) Wint. - Since the last annual summary on cereal diseases a paper has appeared by E. F. Gaines and F. J. Stevenson (Occurrence of bunt in rye. Phytopath. 13: 210-215. May, 1923) giving further information concerning bunt in rye. In the fall of 1921 they found it occurring naturally on one plant of common rye, one F_2 plant of a rye-wheat hybrid, and two F_2 plants of a wheat-rye hybrid. Artificial inoculations showed that at least four varieties of rye are not immune and that several wheat and rye hybrids are susceptible.

Powdery mildew caused by Erysiphe graminis DC. was reported only from New York, Maryland, Michigan, Minnesota and Idaho. No appreciable damage occurred in any state.

Leaf spot caused by Helminthosporium sativum P, K. & B. was reported

from New York (slight) and Minnesota (trace found, no damage.)

Bacterium alboprecipitans Rosen (Rosen, H. R. A bacterial disease of foxtail (Chaetochloa lutescens) Ann. Mo. Bot. Gard. 9: 333-402. Nov. 1922). Artificial infection of five varieties of rye is reported. It has not been found occurring naturally on rye, however.

BARLEY

Covered smut caused by Ustilago hordei (Pers.) K. & S.

Some of the eastern and Ohio Valley states reported more covered smut than last year, but the other states, including those that are most important from the standpoint of barley production, reported about the same as or somewhat less than in 1922. The highest loss estimated was 6% for Kentucky. This was followed by 2% in Maryland and Kansas, 1.5% in Delaware, 1% in Vermont, Connecticut, Virginia, Tennessee, Mississippi, North Dakota, Iowa, and Idaho, and approximately 0.5% in New York, Texas, and Colorado. Some high percentages were noted in individual fields; thus 22% was observed in Delaware, 20% in Kentucky and in Mississippi, and 10% in each of the Dakotas.

The following note from Fairbanks, Alaska is of interest:

> "Barley is the principal crop raised in this district. The only disease of any importance at all was covered smut. I found an average of 16% on the Station Farm this year. It is not as prevalent on the other farms but would average nearly 5%." (Glenn E. Baxter, Aug. 6, 1923)

(See "seed treatment" for control)

Reference:

Tisdale, W. H. An effective method of inoculating barley with covered smut. Phytopath. 13: 551-554. Dec. 1923.

Loose smut caused by Ustilago nuda (Jensen) K. & S.

In New England, New York, Virginia, Georgia, Mississippi, and Indiana this was listed as the most important barley disease. In California, which in 1923 stood first in barley production, this smut was reported especially severe in Orange and San Diego Counties in the Salinas Valley, where it occurred in spots to the extent of 15%. In Arizona, according to J. G. Brown, it was bad in Apache and Yavapai Counties, 8% infection being reported in the latter county. There follow some of the estimates of losses: 5%, Virginia; 3%, Georgia and Kansas; 2.5%, Illinois and Kentucky; 2%, Massachusetts, New York, Maryland, Mississippi; 1%, Vermont, Connecticut, Minnesota, Iowa, North Dakota, South Dakota, and Tennessee. Infections of 47% and 20% were noted in individual fields in Indiana and South Dakota respectively, and 10% was observed in Illinois, Minnesota, and North Dakota.

Collaborators in Minnesota report the variety Lion very susceptible. (See "seed treatment" for control).

BARLEY - Stem rust

Stem rust caused by Puccinia graminis Pers.

This year stem rust of barley was of economic importance in eight states only. Losses were reported as follows:

State	Percent	State	Percent
Connecticut	.5	Iowa	4
New York	1.	North Dakota	3
Ohio	.5	South Dakota	5
Wisconsin	1.	Colorado	5
Minnesota	1.5		

Of these states, Minnesota, North Dakota, South Dakota, and Wisconsin are among the six leading producers of barley.

In Minnesota infection was first observed on June 23. The rust was general but caused severe losses only in the northern part of the state. Reports from North Dakota indicate that, although the infection was general, the loss was reduced by early ripening. In South Dakota the infection reached 10% to 50% in all fields, and many were a total loss. This condition was attributed to exceptionally moist weather in June. The loss in Iowa (4%) was less than has been reported for the average season.

In the leading barley states, California and Kansas, the disease was present but insignificant.

Leaf rust caused by Puccinia simplex (Koern.) Erikss. & Henn.

Slight amounts of barley leaf rust were reported from New York, Kentucky, Ohio, Indiana, Illinois, (found only once in Ogle County), Michigan, Wisconsin, Minnesota, Iowa, Nebraska (observed for first time since 1920), and Colorado. It was common in many of the barley areas in the Sacramento Valley and southern part of California, according to W. W. Mackie. Valleau (1) has recently presented evidence that this rust may oversummer and overwinter on volunteer barley plants in Kentucky.

Reference:

1. Valleau, W. D. Oversummering of leaf rust of cereals in Kentucky. Phytopath. 13: 338-340. 1923.

Stripe caused by Helminthosporium gramineum Rab.

Stripe was about as prevalent as usual in most states, although in Illinois L. R. Tehon estimated that it was above the average. Specimens were received from Zainesville, Texas. The disease has been reported from Texas before, but these are the first specimens to accompany reports from that state.

BARLEY - Stripe

Table 52. Losses from stripe as estimated by collaborators, 1923.

Percent loss	State
5	Iowa
3	Illinois
2	Colorado
1	Indiana, Minnesota, North Dakota, South Dakota
Trace	New York, Delaware, Maryland, Virginia, Mississippi, Louisiana, Wisconsin, Nebraska, Idaho, Washington.

Reports of earliest observation, 1923:

June 1	Ithaca, New York
June 8	Charleston, South Carolina
June 10	Madison, Wisconsin
June 15	Redwood Falls, Minnesota

Progress has been made in the control of this disease. (See seed treatment, page 248)

Reference:

Johnson, A. G., R. W. Leukel, and J. G. Dickson. New seed treatments for controlling stripe disease of barley. (Abstract) Phytopath. 14: 42, Jan. 1924.

Spot blotch caused by Helminthosporium sativum P. K. & B

Spot blotch occurred widely and was of some importance in states like New York, Minnesota and the Dakotas. Practically all of the states reporting mentioned it as about the same as last year and about as usual. Delaware and Wisconsin report satisfactory results with the use of organic mercury compounds in controlling this disease.

Net blotch caused by Helminthosporium teres Sacc.

This disease was probably less serious than the spot blotch in most of the barley states, which, for the most part, reported about the same amount as last year. New York, however, estimated slightly more, with a trace of loss, and Iowa estimated considerably more with about 5% reduction in yield. One field was noted in Minnesota with nearly 50% of the plants killed and 10% infection was observed in both North and South Dakota.

Other diseases

Stripe rust caused by Puccinia glumarum (Schm.) Erikss. & Henn. None

of this rust was reported on barley to the Plant Disease Survey, although it was reported on Hordeum jubatum and on wheat from some of the western states.

Scald caused by Rhynchosporium secalis (Heins.) Davis. Wisconsin, Iowa, Idaho, Washington, and California were the only states reporting scald and in most of these it was apparently of very slight importance.

Foot rot caused by Ophiobolus cariceti (Berk. & Br.) Sacc. Mature perithecia of this fungus were found at Davis, California, and in 1922 H. H. McKinney found barley attacked west of Riverside, California. (W.W. Mackie. Footrot, Ophiobolus in California. Phytopath. 13: 561-562. Dec. 1923.) In New York a careful examination of about 50 barley fields within the take-all infested area was made by R. S. Kirby without finding any infected plants. The observations in that state, up to the present, indicate that for some reason barley escapes infection.

Helminthosporium californicum Mackie & Paxton. A new Helminthosporium disease of barley in California has been described during the past year. (Mackie, W. W., and G. E. Paxton. A new disease of cultivated barley in California caused by Helminthosporium californicum n. sp. Phytopath. 13: 562. Dec. 1923)

Ergot caused by Claviceps purpurea (Fr.) Tul. Traces found on barley in New York, Minnesota, and North and South Dakota.

Anthracnose caused by Colletotrichum cereale Manns was found on Alpha barley at Ithaca, New York, August 1.

Powdery mildew caused by Erysiphe graminis DC. was reported from a number of the eastern states. In Delaware, Adams reports it severe on spring and winter barley, even on the rosette leaves, while adjacent wheat fields showed no infection.

Fusarium blight (scab) caused by Gibberella saubinetti (Mont.) Sacc. New York, Ohio, North Dakota, Iowa, and Nebraska report some of this disease. More than usual occurred in the two last named states. In Iowa a loss of 2% is estimated and in Nebraska it was much more common on barley than on wheat.

Pink root caused by Fusarium sp. was severe in Los Angeles, Orange, and San Diego Counties, California, according to W. W. Mackie.

Bacterium alboprecipitans Rosen can infect barley as shown by artificial inoculation tests. It has not been found occurring naturally on barley, however. (Rosen, H. R. A bacterial disease of foxtail (Chaetochloa lutescens). Ann. Missouri Bot. Gard. 9: 333-402. Nov. 1922.)

OATS

Smut caused by Ustilago avenae (Pers.) Jens. and U. levis (K. & S.) Mag.

Of the thirty-four states reporting on the relative prevalence of oat smut, one-half or seventeen reported it as of almost the same prevalence as last year, while nine reported less, and the remaining eight reported more than in 1922. These differences, although governed somewhat by environmental factors, are in part due to differences in the amount of seed treatment in the various states. Thus, Arkansas and Illinois report a falling off in the amount of seed treatment in the last few years, while in Ohio and Idaho the disease is said to be decreasing each year owing to the widespread practice of seed treatment and

interest in seed improvement. On account of the ease in controlling these diseases, and the publicity that has been given the various seed treatment methods, it is natural to expect a decline in severity until the loss becomes negligible. Although there is probably a steady trend in this direction, the disease will always be present in considerable quantities owing to the fact that farmers are inclined to stop treating when smut is of no consequence and resume treatment only when it becomes serious..

As usual the smut diseases taken together constituted the most important disease factor influencing the yield of oats in the United States as a whole. The estimated losses by states are shown in Fig. 12. Kirby, in New York, distinguished between the two smuts and as a result of many field examinations .. estimated 3.14% loss from Ustilago avenae and 0.83% from U. levis. Glenn E. Paxton reported 2% of each smut occurring in the vicinity of Fairbanks, Alaska in 1923.

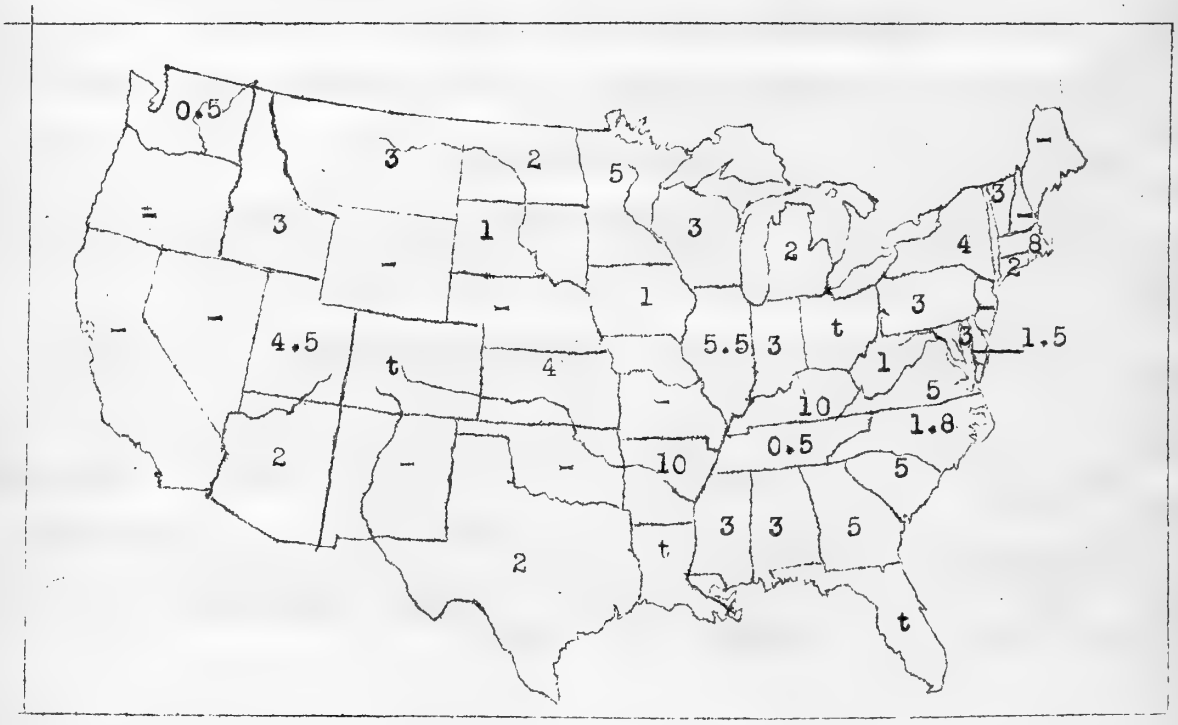

Fig. 12. Estimated percentage losses from the smuts of oats, 1923.

Some of the highest percentages found in individual fields were 60% Minnesota, 48% Wisconsin, 40% New York, 30% Illinois, 25% Mississippi, 20% Virginia, 15% Indiana, 12% New Jersey and Alabama, and 10% North and South Dakota.

The following note from New York regarding the relation of time of planting to smut infection is of interest.

> "The cold, dry weather in March and April delayed the planting of oats in general for several weeks. This difference in the time of planting had a marked influence in one case, at least, on the amount of smut. Samples of the same seed were planted early in April at Ithaca and late in April at Albion. The percentage of smut at Ithaca was 10 percent as compared with 44.1 percent at

Albion. It was further noticed that in certain fields there was a higher percentage of smutted heads in the lower areas. In one field in Tompkins County there was 18 percent of smut in the oats in the low, poorly drained areas while there was only 9 percent on the higher, drier ground." (R. S. Kirby)

Table 53. Dates of earliest observance of oat smut, 1923.

Date	Place	Date	Place
March	Central Florida	June	Fort Collins, Col.
April	Baton Rouge, La.	June 6	Saline County, Ill.
April 24	Attala County, Miss.	June 7	Seaford, Del.
May	North Carolina	June 22	Steuben County, N. Y.
May 3	Denmark, S. C.	June 27	Monmouth County, N. J.
May 28	Sibley County, Minn.	July 3	Mt. Carmel, Conn.
June	Webster, S. D.		

Resistant varieties:

The only note on oat varieties resistant to smut received during the year is that from the Cereal Courier (15: 66. April 30, 1923) which reads as follows:

"Dr. E. F. Gaines, of the Washington Agricultural Experiment Station, Pullman, Washington, during the past winter has discovered that the unnamed variety of oats which he has been carrying under C. I. No. 357-1 is immune to covered smut. In addition, he states in a recent letter to the Office of Cereal Investigations that it has produced a higher average yield than any other oat variety during the 4-year period from 1919 to 1922, inclusive, at Pullman. As this is the first variety of yellow or yellowish-white oats discovered so far that has shown immunity to covered smut, this fact makes it of considerable interest. Doctor Gaines obtained it from the Sherman County Branch Station at Moro, Oregon, in 1919.

"This oat has been grown in the varietal experiments at Moro since 1914, where it has been the highest yielding variety. Because of its high yield, D. E. Stephens, superintendent, distributed it to farmers in Sherman County, Oregon, several years ago under the name of 'Carleton.' As it is now grown commercially to a considerable extent in that county, and also to meet the demands that a definite name be given it, the name 'Carleton' has been officially applied to it."

Control – See also section on seed treatment at beginning of this summary.

New York.– Long Island: A large percentage of farmers are treating oats for smut. The dry method is used almost entirely.

Virginia: General throughout state, averaging about 4% loss. In experimental tests the following results were obtained:

OATS - Smut

Treatment	Percent smutted panicles
Check	6.2
Copper-carbonate, 2 oz. per bu.	4.9
Copper-carbonate, 4 oz. per bu.	4.4
Semesan, 1-400, 2 hr. soak	3.4
Nickel-carbonate, 2 oz. per bu.	2.6
Nickel-carbonate, 4 oz. per bu.	1.8
Formaldehyde, 1-320, 2 hr. soak (Fromme)	0.0

Indiana: Twenty percent of the growers treated the seed. (Gregory)

Illinois: The fields in Franklin and Jackson Counties are splendid examples of what may be secured from a consistent use of treatment. In these counties no loose smut was found in the oats. (Tehon)

Some years ago, seed was generally treated but this practice has gradually died out in the last two years. It will probably be revived when the price of oats rises to the point where growing them will be a profitable industry. (Young)

Michigan: Treatment is almost wholly by dry method. (Coons)

Wisconsin: Seed treatment with formaldehyde satisfactory; method of application not so important as thoroughness of doing the job. (Vaughan)

North Dakota: Seed treatment not so generally practiced as for wheat. (Weniger)

References:

Bartholomew, L. K., and E. S. Jones. Relation of certain soil factors to the infection of oats by loose smut. Jour. Agr. Res. 24: 569-575. May 19, 1923.

Flerov, B. K. Sur la cytologie de Ustilago avenae Pers., d'apres des cultures in vitro. Trav. Sect. Mycol. et Phytopath. Soc. Bot. Russie. 1: 23-36. 1923.

Stem rust caused by Puccinia graminis Pers.

In general the year 1923 was an average year for stem rust. In the principal oats producing region (Iowa, Illinois, and southern Minnesota) the primary infection appeared late and consequently the losses were comparatively small. The highest percentage of loss was 5%. This was reported from both Michigan and North Dakota.

In Minnesota and North Dakota the most severe losses occurred in late fields. There also seemed to be a tendency for the fields farther north to be more heavily infected. In this connection it may be interesting to note that in southeastern Manitoba, according to the Canadian Plant Disease Survey, "Much of the early crop escaped, but in all sections the late crop and in many sections the whole crop was severely injured."

OATS - Stem rust

The following losses were reported from state observers:

Table 54. Estimated percentage losses from stem rust of oats, 1923.

State	Percent loss	State	Percent loss
Vermont	1.5	Wisconsin	.5
Massachusetts	2	Minnesota	1
Connecticut	1	Iowa	1
New York	trace	North Dakota	5
Maryland	trace	South Dakota	4
West Virginia	trace	Nebraska	trace
Alabama	trace	Kansas	trace
Texas	1	Colorado	2
Arkansas	2	Arizona	trace
Ohio	.5	Utah	trace
Illinois	trace	Idaho	trace
Michigan	5	Washington	trace

Resistant varieties:

Stakman, Levine, and Bailey report the existence of at least four distinct biologic forms of Puccinia graminis avenae. White Tartar (Minnesota 139) was shown to be resistant to the two forms collected in the United States, moderately resistant to a form collected in South Africa, and susceptible to a form collected in Sweden.

Literature:

Stakman, E. C., M. N. Levine, and D. L. Bailey. Biologic forms of Puccinia graminis on varieties of Avena spp. Jour. Agr. Res. 24: 1013-1018. June 23, 1923.

Crown rust caused by Puccinia coronata Corda

Crown rust was reported from practically all states east of the 100th meridian. The highest percentages of loss were recorded from the extreme southern states but the disease was of considerable importance in Vermont, New York, Indiana, Illinois, Michigan, Iowa, and the Dakotas. North Dakota experienced another epidemic similar to that of 1922.

In Mississippi and Louisiana collaborators reported that plants were frequently killed by rust before seed formation. In states farther north, where buckthorns (Rhamnus spp.) are a factor, it was mentioned that the heaviest losses occurred in the vicinity of buckthorns. Several cases of the spread of rust from buckthorns were reported in a number of states.

Through the cooperation of the men engaged in barberry eradication, and S. M. Dietz, who is working on crown rust, a preliminary survey for the locations of Rhamnus cathartica was made. As a result of that survey Dietz (1) reports that 820 plantings of this shrub consisting of 89,496 bushes, besides 34,016 feet

of hedge of uncounted bushes, were found in representative areas in eight mid-western states, (Illinois, Indiana, Iowa, Michigan, Minnesota, North Dakota, South Dakota, and Wisconsin).

Table 55. Estimated percentage loss from crown rust of oats in 1923, according to collaborators.

State	Percentage loss	State	Percentage loss
Vermont	3	Arkansas	15
Massachusetts	2	Ohio	0.5
Connecticut	1	Indiana	2
New York	2	Illinois	2.5
New Jersey	1	Michigan	1
Pennsylvania	1	Wisconsin	0.5
Delaware	0.2	Minnesota	0.1
Maryland	trace	Iowa	1
Virginia	1	North Dakota	5
West Virginia	1	South Dakota	1
Georgia	3	Nebraska	trace
Alabama	3	Kansas	trace
Mississippi	6	Montana	0
Louisiana	20	Colorado	0
Texas	2	Washington	0

Table 56. Dates of earliest observation of crown rust, 1923.

State	On oats		On Rhamnus	
	Date	Location	Date	Location
Florida	January			
Louisiana	January	Baton Rouge		
Mississippi	April 9	Oktibbeha Co.		
South Carolina	April 20	Beaufort		
Illinois	June 4	Jackson Co.		
Delaware	June 7	Seaford		
Nebraska	June 15(approx.)			
Minnesota	June 26	Waseca Co.	May 22	St. Paul
North Dakota	June 28	Fargo	June 10	Rugby
New York	July 5	Ithaca	May 5	Bronx
Connecticut	July 5	Orange		
Maine			June 5	
Colorado	August	Ft. Collins		

Late maturing varieties and late planted varieties were mentioned as most affected in Arkansas and Wisconsin. Two states, Florida and Louisiana, report on resistant varieties.

Florida: A variety plot of oats was planted on the Experiment Station grounds for the purpose of making selections of the best varieties to be propagated in Florida. When the plants were six weeks old they were attacked by crown rust (Puccinia coronata Cda.), and as the season advanced the disease spread and became worse. About thirty species and varieties were planted. Of this number about eight showed such resistance to the disease that they headed out. The others were either killed or weakened to such an extent that they could not head. Three of the eight varieties that headed showed considerable resistance. Selections were made and the seed will be planted for further selections. (Weber)

Louisiana: A very mild winter allowed an early growth with a very early infection of the rust. The supposedly resistant varieties were injured very badly. (Edgerton)

References:

1. Dietz, S. M. The role of the genus Rhamnus in the dissemination of crown rust. U. S. Dept. Agr. Bul. 1162: 1-18. Sept. 1923.
2. ———————— Epidemiology studies with Puccinia coronata Corda. (Abstract) Phytopath. 14: 41. 1924.

Halo blight caused by Bacterium coronafaciens Elliott

Fifteen states, for the most part in the north-central and northeastern part of the country, but including Idaho and California, reported halo blight in 1923. Judging from the reports it seemed to be most prevalent in southern Minnesota and the eastern Dakotas and Nebraska. It was scattered in its occurrence in Iowa, Wisconsin, and Michigan and was common but not severe in Idaho and California. North Dakota is the only state reporting more than a fraction of a percent loss. In that state 1% loss was estimatedand W. Weniger reported that at Fargo it was more severe on early planted (May 2) than on later planted oats (May 17). The following are the dates of first observation, according to collaborators:

May 23	Chisago Co., Minnesota
May 28	Central Iowa
June 4	Lafayette, Indiana
June	Brookings, South Dakota
June 10	Agricultural College, North Dakota
July 1	Madison, Wisconsin
July 2	Hockessin, Delaware
July 13	Batavia, New York

Blast (sterility) non-parasitic

The only states reporting heavy losses from blastwere Illinois, where it was serious in some sections and with some varieties, probably causing a reduction in yield for the state as a whole of 5%, and Nebraska, where it was much more common and severe than usual, owing to wet weather at heading time. Kansas

and Idaho each reported 2% loss from this cause. In general there seemed to be less of this trouble than usual.

The observation of L. R. Tehon of Illinois that plants from southern seed blasted severely while those from northern seed were not so seriously affected, is of interest.

Other diseases

Anthracnose caused by Colletotrichum cereale Manns - The only states reporting observations of anthracnose are New York (July 31, Horseheads), Alabama, Mississippi (April 30, Washington County), Louisiana (May, Baton Rouge), Texas, and Wisconsin (July 15, Madison). The disease was of very minor importance.

Fusarium blight (scab) caused by Gibberella saubinetii (Mont.) Sacc. - New York, Minnesota, and North Dakota are the only states reporting that this disease was observed on oats in 1923. Only very slight amounts were noted.

Ergot (Claviceps purpurea (Fr.) Tul.) was reported on oats in Whitman County, Washington, according to B. F. Dana.

Leaf blight caused by Helminthosporium sp., probably H. avenae-sativae (B. & C.) Lind. - This was commonly observed on oats in New York, according to Kirby, but did not do any appreciable damage. It was prevalent on winter oats in parts of Delaware and was very serious in test plots in Florida where Weber noted 20% of the seedlings killed in January plantings.

A leaf spot caused by Septoria sp., probably S. avenae Frank, was more common than usual in Illinois, according to L. R. Tehon. It was estimated that it occurred in nearly 90% of the fields in the state and was probably of some importance on account of destruction of leaf tissue.

Leaf spot caused by Scolecotrichum graminis Fckl. was found in New York on one plant in Seneca County, July 9, and in Orleans County, on July 25. (Kirby)

Powdery mildew (Erysiphe graminis DC.) - Reported on oats from New York.

A blade blight and crown rot, apparently caused by a bacterial organism, was reported from Mississippi where it was first collected in Oktibbeha County, April 24.

Bacterium alboprecipitans Rosen has been successfully inoculated into six oat varieties. (Rosen, H. R. A bacterial disease of foxtail (Chaetochloa lutescens) Ann. Missouri Bot. Gard. 9: 333-402. Nov. 1922).

CORN

Smut caused by Ustilago zeae (Beck.) Ung.

No new facts concerning geographic distribution of corn smut were received in 1923. The disease occurs in all states and probably in almost all sections where corn is grown. It was reported as more prevalent than usual in Connecticut, Delaware, Virginia, Illinois, and Minnesota, but in no state was any outstanding epidemic reported. States reporting less than usual were West Virginia, South Carolina, Georgia, Michigan, and Kansas.

The losses for the country as a whole were probably about normal. The estimated percentage reduction in yield is given in table 57 and revised estimates in bushels will be given in a later publication. In Iowa out of over

57,000 plants that were counted 1.5% showed smut on the ear, and 3.26% showed smut on sterile stalks.

Some of the maximum percentages of infection in individual fields were: 90% Illinois, 50-80% Kansas, 40% Minnesota, 33% Alabama, 25% Colorado and New Mexico, 20% North Dakota, Arkansas, and Virginia.

Table 57. Estimated losses from corn smut, 1923.

Percent loss	States
5	North Dakota
4	Kansas
3	Connecticut, Pennsylvania, Arkansas, Ohio, Illinois, Iowa, New Mexico
2.5	Georgia
2.	New York, Virginia, North Carolina, Alabama, Missouri, South Dakota
1.5	Maryland, Colorado
1.	Vermont, Delaware, West Virginia, South Carolina, Michigan, Utah
0.5	Massachusetts, Indiana, Wisconsin, Minnesota, Kentucky, Tennessee
trace	Mississippi, Louisiana, Texas, Arizona, Idaho, Washington

Sweet corn was mentioned as being affected to a greater extent than field corn in Connecticut, New York, New Jersey, Arkansas, Michigan, Wisconsin, Iowa, and New Mexico. In Iowa about 22% infection was estimated on sweet corn. In Illinois smut was found especially on Democrat, Boone County White, and Reid's Yellow Dent, according to Tehon, and in Michigan, Coons reports it especially severe on Early Cory sweet corn.

Dates of earliest observation of corn smut.

June - Patterson Louisiana
June 21 - Rice Co., Minnesota
June 23 - Adams Co., Illinois
July - Newark, Delaware
July 3 - Hazlet, New Jersey
July - Calhoun, South Carolina
July 14 - Ithaca, New York
August - Brookings, South Dakota
August - Fort Collins, Colorado
August 28 - Wahpeton, North Dakota

Rust caused by *Puccinia sorghi* Schw.

This rust was reported to have occurred widely throughout the United States at least as far west as Arizona. Reports from several of the western states are lacking. In no state was it of much economic importance. In general, it was about as prevalent as or somewhat less so than usual but collaborators in the state group composed of South Dakota, Iowa and Kansas estimated more than last year and more than the average. Even in those states, however, the disease was of only minor importance.

Since the time of attack has considerable influence on the amount of damage by rust, the following dates of earliest observation are given:

July	New Castle, Delaware
July 3	Baton Rouge, Louisiana
July 15	Oktibbeha County, Mississippi, Ramsey County, Minnesota
July 30	Ithaca, New York
August	South Dakota, Kansas, Colorado
August 20	McLean County, Illinois

Rust was reported as more common on sweet corn in Illinois and Iowa. The field corn varieties Democrat and Kent were said to be most commonly attacked in Illinois and Minnesota respectively. During the past year. Mains, Trost, and Smith (1) have reported good results in the selecting of resistant individuals from several varieties of both sweet and dent corn.

References:

Cited

1. Mains, E. B., F. J. Trost, and G. M. Smith. Corn resistant to rust, Puccinia sorghi. (Abstract) Phytopath. 14: 47-48. Jan. 1924.

Not cited

Evans, M. P. Rusts in South Africa II. A sketch of the life cycle of the rust on Mealie and Oxalis. Sci. Bul. Div. Bot. Dept. Agr., South Africa. No. 2, 1923.

Root, stalk and ear rots caused by Gibberella and Fusarium spp.

Root rots were reported as widespread in a large number of states in the eastern half of the country. In some of them they were said to be important locally while in others, such as the Lake States, Iowa, Missouri, and North Carolina, they were thought to be of only slight importance. Root rot is commonly associated with unfavorable soil conditions and so it is often not recognized as a disease and furthermore the losses from it are very difficult to estimate.

Ear rots, other than those caused by Diplodia, are mentioned as very destructive in Florida and Louisiana, where the rainfall was heavy. A thirty acre field at Quincy, Florida, showed 15% to 30% loss. Ear rots resulting from the harvesting of immature corn on account of early frosts, were unusually common in some of the more northern states.

Control of root, stalk and ear rots:

Delaware: Disease free seed corn selected by means of the rag-doll germinating method, showed increases of ten to fourteen bushels in four demonstration tests in Kent County. (Adams)

CORN - Root, stalk and ear rots

Maryland: Progress is being made in the development of resistance through three years of selection. (Temple & Jehle)

Michigan: Seed testing of sweet corn shows great benefit on poorer soils. (Coons)

Kentucky: Some selfed strains have produced a large number of ears which rotted, while others have been entirely free from rotting ears. (Valleau)

References:

Allyn, O. M. Reducing corn root-rot by careful hand selection of seed. Jour. Amer. Soc. Agron. 2: 73-76. 1923.

Dickson, J. G., S. H. Eckerson, and K. P. Link. The nature of resistance to seedling blight of cereals. Proc. Nat. Acad. Sci. 9: 434-439. Dec. 1923.

_____ Influence of soil temperature and moisture on the development of the seedling blight of wheat and corn caused by Gibberella saubinetii. Jour. Agr. Res. 23: 837-870. Mar. 17, 1923.

Hoffer, G. N. and R. H. Carr. Accumulation of aluminum and iron compounds in corn plants in its probable relation to root rots. Jour. Agr. Res. 23: 801-823. 1923.

Holbert, James R., W. L. Burlison, H. Howard Bigger, Benjamin Koehler, George H. Dungan, and Merle T. Jenkins. Early vigor of maize and yield of grain as influenced by the corn rot, stalk and ear rot diseases. Jour. Agr. Res. 23: 583-630. Feb. 24, 1923.

Jehle, R. A., F. W. Oldenburg, and C. E. Temple. Relation of internal cob-discoloration to yield in corn. (Abstract) Phytopath. 14: 46. Jan. 1924.

Manns, Thomas F., and J. F. Adams. Parasitic fungi internal of seed corn. Jour. Agr. Res. 23: 495-524. 1923.

Melchers, L. E., and C. O. Johnston. Second progress report on studies of corn seed germination and the prevalence of Fusarium moniliforme and Diplodia zeae. (Abstract) Phytopath. 14: 45. Jan. 1923.

Sherbakoff, C. D. Common molds of corn seed in relation to yield. (Abstract) Phytopath. 14: 46. Jan. 1924.

Valleau, W. D. Studies on seed infection, ear types, and yield, and the isolation of strains of corn showing specific disease reactions in the germinator. (Abstract) Phytopath. 14: 46. Jan. 1924.

_____ A method of demonstrating seed infection in supposedly disease-free corn. Science n.s. 58: 186. Sept. 7, 1923.

Dry rot caused by Diplodia zeae (Schw.) Lev.

Heavy losses from Diplodia dry rot occurred in Iowa, Missouri, and Kansas, where the disease was apparently more abundant than usual. In the eastern portion of the corn belt conditions did not seem to favor the disease so much, as only a few reports were received. In Iowa it was estimated that about 15% infected seed was planted which injured the stand materially, and later rot of the

stalk, shank and ear became prevalent, causing a loss estimated at about 9%. This loss in the leading corn state of the country, where 430,240,000 bushels were produced in 1923, is a very serious one. In Missouri the disease was by far the most destructive of any of the ear rots and in Kansas it was more injurious than ever before. Dry rot is rapidly coming to be recognized as one of the most serious of the corn diseases.

References:

Durrell, Lawrence. Dry rot of corn. Iowa Agr. Exp. Sta. Res. Bul. 77: 347-376. July 1923.

Holbert, J. R., Benjamin Koehler, and G. H. Dungan. Studies on the Diplodia disease of corn. (Abstract) Phytopath. 14: 47. Jan. 1924.

Manns, T. F., and J. F. Adams. Parasitic fungi internal of seed corn. Jour. Agr. Res. 23: 495-524. Feb. 17, 1923.

Melchers, L. E., and C. O. Johnston. Second progress report on studies of corn seed germination and the prevalence of Fusarium moniliforme and Diplodia zeae. (Abstract) Phytopath. 14: 45. Jan. 1924.

Brown spot caused by Physoderma zeae-maydis Shaw

Brown spot was reported in the South Atlantic and Gulf Coast States from North Carolina to Louisiana, and also in Arkansas, Ohio, Indiana, and in Illinois, which was the only state reporting more than usual. In that state it was very prevalent and, according to L. R. Tehon, was observed in ten widely scattered counties. It was found as far north as Carroll County in the northern part of the state. One hundred percent infection was observed in some fields. Collaborators in each of the Gulf States mention attack of the stalk near the ground with subsequent breaking over.

Dates of earliest observation, 1923.

June	New Orleans, Louisiana
June 20	Oktibbeha County, Mississippi
July 20	Monroe County, Illinois
July 27	Seneca, South Carolina
August 5	Battleground, Indiana

The dent varieties - Boone County White, Yellow Dent, Reid's Yellow Dent, and Democrat were mentioned as susceptible in Illinois, and in Indiana the only observation that was made was on Early Yellow Dent.

Bacterial wilt caused by Aplanobacter stewartii(EFS.) McCul.

Massachusetts, New York, Maryland, Virginia, Ohio, Indiana, Illinois, Missouri, and Kansas reported this disease on sweet corn. As high as 15% infection was observed in Maryland, and in Illinois, Tehon reported 5 to 30% infection in three small fields in Adams County and from 60% to 90% rotten

stalks in a three-acre field in Union County. The disease was considered worse than usual in Ohio, Indiana, and Illinois. Most of the reports were on sweet corn but it was common on dent field corn in Illinois, and in New York a field of pop corn was severely infected. Golden Bantam was the sweet corn variety most commonly reported diseased. In a recent article, Rand (1) has given a list of varieties in order of their susceptibility, according to trials in 1919 and 1920.

Reference:

1. Rand, F. V. Bacterial wilt or Stewart's disease of corn. The Canner. 56^{10}: 164-165. Mar. 1923.

Mosaic, cause undetermined

C. W. Edgerton, of Louisiana, reports corn mosaic as follows:

> "Very common with often high percentages of infection in the sugar cane belt. Reduces the yield to some extent, but evidently does not do the damage that is reported for tropical countries. Yellows the leaves and stunts the plants. It occurs in the southern part of the state."

Leaf blight caused by Helminthosporium turcicum Pass.

Connecticut, Delaware, West Virginia, Florida, Mississippi, and Missouri reported this disease. It was much less prevalent in the first two states than in 1922, when it was epidemic. As a whole the disease was of very slight importance.

Bacterial stalk rot caused by Bacterium dissolvens Rosen

A slight amount of this disease was noted this year in Arkansas counties bordering the Mississippi River, according to H. R. Rosen. Two infected plants were also found in Alexander County, Illinois, on July 28. This is a new locality for Illinois.

Black bundle caused by Cephalosporium acremonium Corda.

Reddy and Holbert (1) have recently reported this disease of corn for the first time. They believe it to be an important cause of reduction in corn yields through promoting excessive suckering, barrenness, nubbin production and the like. The disease has been noted in Connecticut, New York, Ohio, Indiana, Illinois, Wisconsin, Minnesota, Iowa, South Dakota, Kansas, South Carolina, and California, and the authors make the statement that it probably occurs wherever corn is grown in the United States.

L. R. Tehon reports that black bundle was apparently quite important in Illinois last year. In Clark County one field showed 3% of the stand affected.

A disease associated with Hyalopus sp. which is probably the same as black bundle was observed in New York as very common on Long Island from 1920

to 1922, and in 1923 it was observed for the first time in Orange County, New York, according to R. S. Kirby.

Manns and Adams (Science n.s. 54: 385-387, 1921) have called attention to the parasitism of Cephalosporium as an ear mold but Reddy and Holbert are the first to recognize it as a disease of the corn plant.

Other diseases

Basisporium gallarum (Coniosporium sp.) causing a cob rot of field corn, was very important in Iowa, according to Melhus. It became general during the latter part of September, rotting the shank and base of the ear. According to G. P. Clinton and F. A. McCormick it appears to be parasitic on matured ears of corn in Connecticut also.

Head smut caused by Sorosporium reilianum (Kühn) McAlp. continued present in considerable amounts in field and garden corn in the vicinity of Pullman, Washington, according to B. F. Dana.

Sclerotium rolfsii Sacc. was common on corn in Florida, according to G. F. Weber.

Macrosporium sp. was recorded as causing a conspicuous spotting on the leaves locally in Florida.

Leaf blight of sweet corn, cause unknown, but reported in previous summaries from this office as probably due to bacteria, was noted by Hungerford in several gardens at Moscow, Idaho, where it was blighting the leaves and even killing some of the plants. Diseases of a similar nature were reported from Wisconsin and Florida in 1923.

Reference:

1. Reddy, Charles S., and James R. Holbert. The black bundle disease of corn. Jour. Agr. Res. 37: 177-205. Jan. 26, 1924.

RICE

Straighthead (non-parasitic) was reported from Louisiana (of considerable importance, about the same as usual), Texas (prevalent, loss 3%), and Arkansas (common, varieties Honduras, Storm Proof and Prolific seem most susceptible and Jap and Blue Rose less so).

Blast caused by Piricularia oryzae Br. & Cav. Louisiana (not very important), Texas (trace), and Arkansas (quite common and serious in isolated localities).

Sesame spot caused by Helminthosporium oryzae De H. was collected at Gainesville, Florida, where 100% infection occurred in one small patch.

References:

1. Nishikado, Yoshikazu. Effect of temperature on the growth of Helminthosporium oryzae Br. D. Haan. Ann. Phytopath. Soc. Japan 1: 20-30. 1923. In Japanese, English summary: p.29-30.
2. Willis, L. G. and J. O. Carrero. Influence of some nitrogenous fertilizers on the development of chlorosis in rice. Jour. Agr. Res. 24: 621-640. May 19, 1923.

Rust caused by Melampsora lini (Pers.) Desm.

The facts received regarding rust are contained in the following reports: Wisconsin - Same as usual, minor. (Vaughan). Minnesota - Generally prevalent, less abundant on uplands than on low soils, especially peat, developed rather late. (Sect. Plant Path.) North Dakota - More prevalent than last year or the average year and of considerable importance, probably causing a loss of 1% in the state. It occurred in the Red River Valley and as far west as Mandan. (W. E. Brentzel). South Dakota - Of slight importance, occurring only in eastern South Dakota. (Evans)

The dates of earliest observations were -

June 28	Winthrop, Minnesota
July 5	Fargo, North Dakota
July	Aberdeen, South Dakota
July 30	Madison, Wisconsin

Wilt caused by Fusarium lini Bolley

The following losses from wilt were reported: Minnesota 5%, North Dakota 10-15%, South Dakota 2 to 3%. Iowa and Wisconsin also reported slight amounts of the disease, but no estimates of loss were given.

The situation regarding this disease is well outlined in the two statements below by W. E. Brentzel, located in North Dakota, and A. C. Dillman, agronomist in charge of flax investigations in the Bureau of Plant Industry.

> "Due to warm dry weather in the first two weeks of June, wilt was more severe than in average years. The flax acreage was greatly increased this year. The demand for resistant seed exceeded the supply. Susceptible seed was sown on many wilt-infested fields. The loss ranged from a trace to 100% of the crop." (W. E. Brentzel)

> "Genuine wilt-resistant flaxseed is in great demand, because flax is being grown more extensively on old lands. Considerable losses from wilt occurred in parts of Minnesota, eastern South Dakota, and eastern North Dakota because farmers were unable to obtain wilt-resistant flax and took a chance in seeding common flax.
>
> "New varieties of wilt-resistant flax which give very great promise are Winona and Chippewa, developed at the Minnesota Agricultural Experiment Station, and now being increased for distribution. At the Northwest Experiment Station, Crookston, Minnesota, 24 acres of the Chippewa flax were grown this year, with prospects of a very large crop of seed. N. D. No. 40013, C.I. No. 241, is a new wilt-resistant variety selected by T. E. Stoa, of the North Dakota Agricultural Experiment Station. This variety produced the highest yield in the varietal plats at Mandan, this year. Slope, C. I. No. 274, a new variety developed at Mandan, is very similar to C. I. No. 241. A selection of Argentine flax developed by H. D. Long, of the North Dakota Agricultural Experiment Station, is also very promising." (A. C. Dillman in Cereal Courier, 15: 247, Sept. 20, 1923)

"Pasmo" caused by Phlyctaena linicola Speg.

During the year this recently reported (1) disease of flax was found in three new states, - Wisconsin, Minnesota, and South Dakota (2).

Michigan: Twice as prevalent as last year causing a marked reduction in seed yield and spoiling fiber. At present it is localized at East Lansing where it was noted this year about August 1. The chief danger from this disease lies in its possible spread to other sections. (R. Davis)

Minnesota: Specimens have been received from Watonwan, Hennepin, and Ramsey Counties, Minnesota. The disease probably occurs elsewhere but so far it has not been reported to my knowledge. It apparently has done considerable damage in Watonwan County, as it was noticed by the county agent there and sent in for determination. The disease is rather destructive in small plots in Hennepin County but somewhat less prevalent at University Farm. (A. W. Henry)

North Dakota: The Pasmo disease of flax was common in the eastern half of the state this year. It has not been reported from the western part as yet. Certain varieties showed marked susceptibility to the disease this year, particularly those having a relation to Argentine flax. In the Red River Valley infection ranged from a trace to 100%, based on number of plants found infected. (W. E. Brentzel)

South Dakota: On the Belle Fourche Experiment Farm, Newell, S. Dak., Mr. (Arthur C.) Dillman discovered an infection of the pasmo disease of flax which recently has been described by W. E. Brentzel, assistant pathologist. This was found in a late sown plat of N. D. R. No. 114 flax, being quite generally distributed throughout the plat of about one-eighth acre. It was estimated that about 7% of the plants were affected. (Cereal Courier 15: 247. Sept. 20, 1923)

References:

1. Brentzel, W. E. A disease of flax not previously reported in the United States. (Abstract) Phytopath. 13: 53-54. Jan. 1923.

2. ——— Further investigations on the pasmo disease of flax. (Abstract) Phytopath. 14: 48-49. Jan. 1924.

Heat canker (Non-parasitic)

Heat canker was more destructive than usual, especially on early sown flax, in Minnesota and North Dakota, due to an early, hot period that occurred on June 2 and 3. As high as 13% of cankered plants was noted in trial plots in Hennepin County, Minnesota, while 75% was observed in North Dakota and an estimated loss to the state of 5% was reported by W. E. Brentzel.

BUCKWHEAT

Ramularia rufo-maculans Pk. was collected by E. B. Mains for the first time in Indiana. Specimens are on file from Michigan and a report from Connecticut is on record.

Ascochyta fagopyri Bres. was collected and determined by E. E. Honey, Nov. 3, in Tompkins County, New York. This is the first report to the Survey from New York.

SORGHUM

Covered kernel smut caused by Sphacelotheca sorghi (Link) Clinton.

Connecticut, Mississippi, Minnesota, North Dakota, Kansas, Texas, New Mexico, Colorado, and Washington reported this smut in 1923. In Minnesota it was observed only on varieties introduced from Kansas. More smut than usual occurred in Kansas, where 4% loss to grain sorghum was estimated, and a maximum of 80% infection was observed in individual fields. In the state of Washington a maximum of 30% was noted in a field of broom corn, and in North Dakota and Minnesota as high as 30% and 37%, respectively, were observed. Average losses of 1% were estimated for the states of Texas and North Dakota.

That sorghum varieties differ markedly in their susceptibility to this smut is shown by the results of a test made in Kansas in 1922. (Melchers, L. E., and C. O. Johnston. Sorghum smut investigations. Cereal Courier 15: 28-29. Feb. 28, 1923.)

Table 58. Data on varietal experiment with sorghums to determine resistance to kernel smut, Kansas Agricultural Experiment Station, 1922.

	Variety	Percent smut
1	Blackhull kafir	38.1
2	Spur feterita	0
3	Red Amber sorgo	23.9
4	Dwarf Hegari	0
5	Black Amber sorgo	8.0
6	Standard White milo	0
7	Shrock sorghum	35.7
8	Feterita (C. I. No. 782)	0
9	Dawn kafir	60.0
10	Husserita	33.3

For results on control see section on seed treatment.

References:

1. Johnston, C. O. and L. E. Melchers. Fungicidal treatments for the control of sorghum kernel smut. (Abstract) Phytopath. 14: 44. Jan. 1924.
2. Reed, G. M. Varietal resistance and susceptibility of sorghums to Sphacelotheca sorghi (Link) Clinton and Sphacelotheca cruenta (Kühn) Potter. Mycologia 15: 132-143. May 1923.

SORGHUM - Head smut

Head smut caused by Sorosporium reilianum (Kühn) McAlp. Texas (trace); Minnesota (Occurred chiefly in the neighborhood of Waconia, the center of the sorghum industry of the state; serious in some fields, marked variation in susceptibility occurred in selfed lines); Kansas (Only report received was from Colby, where it occurred on yellow milo; the first report on this variety in America); New Mexico (Slight, not common).

Loose kernel smut caused by Sphacelotheca cruenta (Kühn) Potter

Texas and Oklahoma are the only states reporting this smut. See reference (Reed, 2) on varietal susceptibility under covered kernel smut above.

Bacterial blight caused by Bacillus sorghi Burr.

Bacterial blight was reported from Illinois, Wisconsin, and Iowa. From Illinois, L. R. Tehon reported:

> "Found in practically all fields visited (in the broom corn region of Douglas County) where there was 100% infestation upon plants, the disease varying from merely a trace up to a maximum of spotting and rarely entire plants were so thoroughly infested as to be badly stunted and rotted throughout the entire interior. In one field not less than one in every 500 plants was that badly affected."

Other diseases

Anthracnose caused by Colletotrichum sp. occurred in Illinois in the broom corn section of Douglas County, where it and bacterial blight (Bacillus sorghi) constituted the two most serious diseases. Mississippi also reported the disease.

Leafspot caused by Cercospora sp. occurred in Mississippi and Florida. From the latter state G. F. Weber reported:

> "Cercospora longipes Butler caused considerable loss of leaf area in a field (of sorghum) near Gainesville. The leaves were three-fourths killed soon after blossoming time.
>
> "It caused almost a total destruction of leaves on Kaffir corn in a field near Gainesville. All leaves were completely killed soon after blossoming time."

Rust caused by Puccinia purpurea Cooke. Traces of this rust were found in Florida and Mississippi. In no instance was it of any particular importance.

A bacterial disease of broom corn and sorghum, caused by Bacterium andropogoni EFS., has just been described by Charlotte Elliott and E. F. Smith. (1).

Bacterium alboprecipitans has been used to artificially infect Holcus sorghum and H. sorghum sudanensis according to Rosen (2).

SORGHUM – Other diseases

A stalk rot of undetermined cause has been noticed for a number of seasons by Melchers in Kansas. It is not common, but has occurred frequently in certain pure lines of sorghum.

A kernel rot associated with Fusarium was noted affecting 100% of the kernels in heads of almost mature plants in Florida, according to G. F. Weber.

References:

1. Elliott, Charlotte, and Erwin F. Smith. A bacterial disease of broomcorn and sorghum. (Abstract) Phytopath. 14: 48. Jan. 1924.
2. Rosen, H. R. A bacterial disease of foxtail (Chaetochloa lutescens). Ann. Missouri Bot. Gard. 9: 333-402. Nov. 1922.

DISEASES OF FORAGE CROPS

A. LEGUMES

ALFALFA

Leafspot caused by Pseudopeziza medicaginis (Lib.) Sacc.

The majority of the states reported this common alfalfa disease, indicating that it was widely distributed, as usual, with the crop. The only states reporting more than normal prevalence are Delaware, Illinois and Indiana. In the two last it was especially serious on the second cutting. In general the disease was considered of only slight importance, but in Iowa 10%, and in Illinois and New Mexico 5% loss was estimated.

Yellow leaf blotch caused by Pyrenopeziza medicaginis Fckl.

Reports of this disease were received from widely scattered states, from New York in the east to Washington in the northwest. One percent loss to the first cutting was reported in New York and 2% was estimated for Kansas and Idaho, where it occurred with more than the usual severity. Collaborators in Iowa also reported it important and more abundant than last year.

Root rot caused by Sclerotinia trifoliorum Erikss.

Virginia (severe locally), Kentucky (about the same, slight), and Oregon reported this root rot. It was also collected in Orange County, New York on October 12. This is the first record this office has of the occurrence of this disease in New York. From Oregon, H. A. Schoth reported:

"At present the alfalfa growers in southern Oregon, in the Grants Pass district, are having some trouble with this

disease. Last year it did considerable damage in a few places while this year the damage was very slight."

Eel worm disease caused by Tylenchus dipsaci (Kühn) Bastian.

In 1922 this nematode was known to occur only in three or four fields at Hermiston, Oregon. In 1923, however, surveys conducted under the leadership of G. H. Godfrey showed the nematode to be much more widely distributed in the northern part of Umatilla County, Oregon than was realized. The indications were that it had been present in that region for several years.

In the Yakima Valley in Washington it was found all the way from Yakima to Kenewick, some fields being severely infested, others only slightly so and still others entirely free. Fields around Pasco, which is across the Columbia River from Kenewick were free from the disease.

A considerable number of alfalfa fields in the Walla Walla district Washington, in the vicinity of Pendleton and La Grande, Oregon, and in southern Idaho were examined and found to be free from infestation.

In California the disease was discovered on six or eight different farms near Watsonville within three miles of a field from which it was first reported in April 1923. An attempt is being made to eradicate it in that section.

A careful survey made in the Yuma and Salt River projects in Arizona and around Bard, Riverside, and Sacramento failed to disclose any of the eelworm disease.

From Colorado, collaborator C. D. Learn reported infestations in two localities, reports being accompanied by specimens. The first occurrence was noted June 7 in Canon City, Fremont County and the second later in the season in Walsenburg, Huerfano County. Regarding these occurrences Learn writes as follows:

"The plot at Canon City consists of about 1-1/2 acres on a ridge with ditch on two sides with waste water running into the valley. There is a suspicious plot about a mile distant and it is not at all improbable that it is scattered down the valley for some distance. This can only be determined by a careful survey. The extent of the area at Walsenburg has not been determined."

Literature:

Godfrey, G. H. Watch for alfalfa eelworm. Oregon Farmer 36^{16}: 6-7. April 19, 1923. Washington Farmer 48^{21}: 10. May 24, 1923.

———— The alfalfa stem nematode (Tylenchus dipsaci). California Dept. Agr. Mo. Bul. 12: 299-303. June 1923.

———— The eelworm disease; a menace to alfalfa in America. U. S. Dept. Agr. Cir. 297: 1-8. Oct. 1923.

———— Present status of stem and bulb nematode in America. (Abstract) Phytopath. 14: 62. Jan. 1924.

Smith, E. H. The stem nematode of alfalfa in California. California Dept. Agr. Mo. Bul. 12: 136-138. March-April 1923.

ALFALFA - Rust

Rust caused by Uromyces striatus Schroet. = (U. medicaginis Pass).

The majority of the southern states including Arizona and California reported this rust. In Indiana, Wisconsin, Missouri, and Kansas it was also recorded.

Root rot caused by Ozonium omnivorum Shear

Serious as usual, especially in irrigated fields in the Rio Grande Valley, Texas. An estimate of 5% loss is made for the state. It was also of importance in Arizona, where it was reported from all counties, excepting Navajo, Apache, and Coconino. A loss of 1,000 acres was estimated for Yuma County and 15% of the crop for Yavapai County.

Reference:

King, C. J. Cotton root rot in Arizona. Jour. Agr. Res. 23: 525-527. Feb. 1923.

Anthracnose caused by Colletotrichum trifolii Bain

Missouri: General and severe around Charleston, according to I. F. Scott and W. B. Maneval.

Mississippi: Very serious, probably causing a loss of about 3% in the state. Especially destructive in the delta region where most alfalfa is grown. Some large fields abandoned on account of this disease. First appearance April 10. (Neal and Barker)

Bacterial blight caused by Bacterium medicaginis (Sackett) EFS.

Slight amounts were reported from Colorado, Arizona, Idaho, and Washington. From Arizona, J. G. Brown writes that it was observed only at the higher altitudes in Yavapai County, where it first appeared early in April.

Downy mildew caused by Peronospora trifoliorum de Bary

Was reported from a considerable number of widely scattered states, both eastern and western. New York, Michigan, and Iowa report about as much as any state. Collaborators in Iowa, Kansas, and Arizona made especial note of its occurrence in newly planted fields.

Other diseases

Leafspot (Cercospora medicaginis E. & E) - Texas (traces).
Crown wart caused by Urophlyctis alfalfae (Lag.) Magn. Quite generally distributed throughout California. (Milbrath)

ALFALFA - Other diseases

Violet root rot caused by Rhizoctonia medicaginis (DC.) Tul. Plants affected with this disease were collected in October from a single field near Paw Paw, Michigan, where it was causing a severe killing of alfalfa. This is the first report from Michigan. The only other state reporting this root rot was Kansas, where it was quite common especially in the older alfalfa fields.

Dodder (Cuscuta spp.) Reported from New York, Texas, New Mexico and Washington.

Root rot associated with species of Fusarium. Reported from -

Illinois: More than average, loss slight but serious where it occurred in the northwestern part of the state. (Tehon)

Missouri: Occurred on several farms in Scott County. (Maneval)

Idaho: A few infected plants in many fields. (Hungerford)

Washington: What appears to be a definite root rot due to a species of Fusarium was first reported from Starbuck, May 10, and has since been found near Benton City. (Dana)

Root rots of uncertain cause were reported from Kentucky, Indiana, and South Dakota. W. D. Valleau reports the following from Kentucky.

"Difficulty has been reported in securing stands of alfalfa following alfalfa. One field under observation which followed a previous crop has never done well, although the first crop was good. It yellows badly, while alfalfa planted for the first time a few feet away remains green. The roots show numerous rot lesions."

Mosaic of alfalfa was found in small amounts in Genesse, Herkimer, Livingston and Schoharie Counties, New York. It was first found June 15 at Central Bridge. (R. S. Kirby)

White spot (undet.) was reported from the Upper Peninsula of Michigan, June 15. This is the first report from Michigan.

Slime mold (Physarum sp.) was reported by R. P. White of Kansas to be very important during June in some fields in Riley County Kansas. It smothered out the plants in spots, being favored by a very wet spring.

General reference:

Scott, C. E. Diseases of alfalfa in California. Mo. Bul. California State Dept. Agr. 12: 151-152. 1923.

RED CLOVER

Anthracnose caused by Colletotrichum trifolii Bain and Gloeosporium caulivorum Kirch.

The diseases caused by these two fungi are not usually separated by collaborators and so they are reported under the same heading in this summary. The majority of reports concerned the Colletotrichum, however. In 1923

anthracnose was reported to the Survey from Pennsylvania (present in most fields), Delaware (leaf spot generally observed on first growth), Virginia (severe injury wherever seen, probably causes more loss than all other clover diseases combined), Louisiana (trace seen), Texas (trace), Indiana (same as usual, of little importance), Michigan (more severe than last year), Iowa (less than usual).

References:

1. Monteith, John Jr. Relative susceptibility of red clover to anthracnose and mildew. (Abstract) Phytopath. 14: 62-63. Jan. 1923.
Plants from seed grown in Italy or other countries in Southern Europe are very susceptible to anthracnose, while many, although not all, of the American clovers are somewhat resistant.
2. Ware, W. M. "Scorch" or Gloeosporium disease of red clover. Jour. Min. Agr. Great Britain 30: 833-836. Dec. 1923.
In six small trial plots an English broad red clover was strongly attacked, Chilian and English "cow-grass" red clover and English late-flowering red were attacked to a less extent, "perennialised broad red" was only slightly attacked, and "Hersnap"(a Danish strain) showed only a very few lesions with no broken stems.

Powdery mildew caused by Erysiphe sp.

Powdery mildew of red clover was delayed in its appearance this year and so the first crop largely escaped heavy infection in most states. Commencing with the second crop, however, the disease became very conspicuous and before the season closed it had been reported widespread in practically all of the eastern states as far west as the Dakotas, Colorado, Arkansas, and Louisiana. It was also reported from all of the Canadian Provinces east of Saskatchewan (Canadian Plant Disease Survey). Practically all of the reports are in agreement that in general the mildew was less severe than last year (1922) although in northern New England observations pointed toward equal severity.

From Washington and Idaho reports were received of the powdery mildew of clover (Erysiphe polygoni DC.) that has been observed frequently in that part of the country before. This form produces perithecia freely while the more recently observed eastern form does not. The Washington and Idaho reports also indicate that it was more common on alsike than on red clover while in the case of the eastern form the reverse is true.

The following are some typical state reports.

Maine: As far as I have observed powdery mildew on red clover again appears to be almost universal in southern Maine. Some fields where the second crop has grown up after haying are simply white with it. I have not had opportunity to make observations in northern Maine but since alsike clover is grown there considerably more than red clover it is probable that they are having less trouble. (Morse)

New Hampshire: We had a very dry summer and fungous diseases have been less prevalent than usual. The powdery mildew of clover, however, was just as conspicuous and widespread as usual. (Butler)

RED CLOVER – Powdery mildew

Vermont: Very abundant this season as it has been for the past two or three years. (Gilbert and Lutman)

Massachusetts: Reported throughout the state and more severe even than in 1922. Apparently it appeared somewhat earlier than last year. Found only on Trifolium pratense and apparently not transferable to T. incarnatum, T. medium or T. repens. (Osmun)

New York: This pathogene appeared in the lower Hudson Valley about June 14 to 15 and in the central and western part of the state June 16 to 20. It occurred wherever red clover is grown. (Kirby)

Pennsylvania: General but much less than the three previous years. (Thurston)

Delaware: Slightly prevalent with early growth in June. After first cutting very little evidence of disease found. Drouth conditions seriously affected hay crop and pastures. In August, the disease again became prevalent. (Adams)

Virginia: Less. Considerable complaint. Came later than last year. (Fromme)

Kentucky: Fergus reports that on November 13, 1922, 5% of leaves were infected. On November 29, 1922 practically none. All through the winter none could be found. On June 26, 1923 it was just beginning to appear and slowly developed through the summer. (Valleau)

Alabama: Little. Observed occasionally on volunteer plants of red clover. (Miles)

Louisiana: About same. Of some importance. (Edgerton)

Ohio: Quite generally distributed but apparently causes little injury. (Young)

Indiana: Statewide with crop, worse in southern Indiana. Conspicuous in Knox County July 24. Appeared after the first cutting. (Mains and Gardner)

Wisconsin: Less than last year. More than average year. Minor importance. Came late on second crop only. (Vaughan)

Minnesota: Less than last year. More than for average year. Of no importance until late in season. (Sect. Plant Path.)

Missouri: Survey from Kansas City to St. Louis, shows that the plague is all over the rich bottoms and hills bordering the Missouri River and reports come in from the rest of the state as general. It is not perhaps generally as white as last year but it is on quite as many leaves. (Burrill)

RED CLOVER -- Powdery mildew

South Dakota: All red clover heavily infected. Seems to do no damage. (Evans)

Kansas: About the same as last year, of minor importance, appeared very late and occurred all over the state. (Melchers)

Colorado: Noted for the first time in the state in two localities only on medium red clover. (Learn)

Dates of earliest observation, 1923.

April	Baton Rouge, La.	June 16	Sunderland, Mass.
May 1	Panola Co., Miss.	June 20	Seaford, Del.
May	Columbia, Mo.	June 26	Kentucky.
May 22	Edwardsville, Ill.	July	Brookings, S. D.
May 29	Knoxville, Tenn.	July 1	Fargo, N. D.
May 30	Clemson College, S.C.	July 11	Orange, Conn.
June (early)	North Carolina	July 14	Cass Co., Minn.
June 5	Bedford, Va.	July 15	Wisconsin.
June 16	Columbia Co., N. Y.	July 15	East Kingston, N. H.

Collaborators in Pennsylvania, Indiana, and Louisiana all confirm the observations previously reported that American strains of red clover are more susceptible than those from Europe and South America.

References:

Mains, E. B. Differences in the susceptibility of clover to powdery mildew. Proc. Indiana Acad. Science. 38: 307-313. 1923.

Monteith, John Jr. Relative susceptibility of red clover to anthracnose and mildew. (Abstract) Phytopath. 14: 62-63. Jan. 1924.

U. S. Dept. Agr. Plant Disease Reporter 7: 17, 26, 40-41, 55-56. 1923.

Rusts caused by Uromyces spp.

In a recent abstract (1) W. H. Davis has reported three different rusts on our common clovers. The rust on white clover (Trifolium repens) he considers to be Uromyces trifolii-repentis (Cast.) Liro. The rust on red clover (T. pratense) and on mammoth clover (T. medium) is Uromyces trifolii (Hedw.) Lév. and that on alsike clover (T. hybridum) he calls Uromyces hybridi Davis.

For the most part the reports that came in to the Plant Disease Survey did not specify the kind of clover on which rust was occurring. Twenty-three states reported the disease on clover but only five mentioned the kind of clover as follows: Connecticut, New York, Alabama, and Georgia specifically mentioned red clover as being rusted; Connecticut and New York reported rust on white clover; and these two states as well as Massachusetts and Washington reported alsike as being affected.

The following are the dates of first observation of the rust in 1923 according to collaborators:

RED CLOVER - Rusts

Red clover - June 14, Otsego County, New York.
June 25, Ramsey County, Minnesota

White clover - July 11, Millford, Connecticut
May 5 - New York

Alsike clover - June 7, Highwood, Connecticut
June 11, Le Roy, New York

Table 59. Taxonomy of clover rusts.

Kind of Clover (Trifolium)	Species of Uromyces according to	
	Davis (1) (Uromyces)	Arthur (2) (Nigredo)
T. pratense - red	U. trifolii (Hedw. f) Lév.	N. fallens (Desm.) Arth.
T. repens - white	U. trifolii-repentis (Cast.) Liro	N. trifolii (Hedw. f) Arth.
T. hybridum - alsike	U. hybridi Davis	N. trifolii (Hedw. f) Arth.
T. medium - mammoth	U. trifolii (Hedw. f.) Lév.	N. fallens (Desm.) Arth.
T. incarnatum - crimson		N. fallens (Desm.) Arth.
		N. trifolii (Hedw. f) Arth.

References:

1. Davis, W. H. Summary of investigations on clover rusts. (Abstract) Phytopath. 14: 33. Jan. 1924.
2. Arthur, J. C. Aecidiaceae. Uredinales. N. Am. Fl. 7^3: 254-255. 1912.

Mosaic, cause undetermined

Four states reported clover mosaic. It is probable that the disease reported is a true mosaic although the reports do not indicate that successful infection tests were conducted. Mosaic on red clover was reported from New York (May 15), Indiana (widespread), and Louisiana (May 4 at Baton Rouge, first report in state). On crimson clover Connecticut and Indiana reported mosaic. In the latter state a plot of 47 varieties and eleven species showed some mosaic on crimson clover only. Mosaic on white and alsike clovers is also reported from New York.

Root rot caused by Sclerotinia trifoliorum Erikss.

In addition to reports from the Middle Atlantic and Ohio Valley states

where this root rot is commonly found, information was received for the first time of its occurrence in New York and Idaho. In New York it was observed in three counties in the Hudson Valley, being first seen June 16 at Volatie, Columbia County. In Idaho it occurred at Dudley in red clover fields along the Coeur d' Alene River where it was rather severe locally. A report is at hand from Ingham County, Michigan and the following statement by H. A. Schoth, Assistant Agronomist of the Oregon Agricultural Experiment Station showing the situation in the Willamette Valley has been contributed through A. J. Pieters of the Department of Agriculture.

"The Sclerotinia that is prevalent and which is doing considerable damage to legumes in the Willamette Valley is Sclerotinia trifoliorum. It attacks alsike, red, white, crimson, sweet, and Ladino clover, alfalfa, lupines, vetches, and field peas.

"The distribution and heaviness of its attack varies with the condition of the crop and the climatic peculiarities, and apparently to some extent on soil conditions.

"The period of attack is usually during early spring, March and April, and extending into July. The length of period of attack depends largely upon the climatic conditions, although plant conditions have a noticeable influence at times.

"The most damage is usually done after a mild winter during which the plants have made a heavy growth and a dense covering over the ground. This condition, which results in rather poor air circulation and holding of moisture at the surface, together with warm moist weather, is ideal for rapid spread of the disease.

"Plants on land that is low and holds the moisture until warm weather sets in are often attacked worse than those growing on higher, better drained land.

"The extent of the attacks varies considerably during different years. In 1921 I had occasion to examine several fields of clover and vetch attacked by this disease. One 40-acre field of alsike clover was practically destroyed and the sclerotia covered the ground in such quantities that they could be scraped together and gathered by the handful. I also saw severe attacks on red clover and common and purple vetch. Sweet clover here at the station and another planting three miles from here were almost completely destroyed. Fields of red and alsike clover near the attacked ones were almost free from the disease, showing that it is not everywhere to the same extent at the same time. During 1922 and 1923 there has been comparatively little trouble from the disease. Whether this is due to the comparatively small acreage, to crop rotation methods, or to unfavorable climatic conditions at some certain period, I do not know."

Other diseases

Root rots associated with Fusaria were reported from Ohio, Indiana, and Idaho. A very striking and significant illustration of the effect of steriliged and unsterilized soil on the growth of clover in Kentucky has been given in Plant Disease Reporter 7: 105-106. Nov. 1, 1923.

RED CLOVER - Other diseases

Nematode - Tylenchus dipsaci (Kühn) Bastian. This nematode was common and very important in old clover fields in Twin Falls and Canyon Counties Idaho according to C. W. Hungerford.

Sooty spot caused by Phyllachora trifolii (Pers.) Fckl. =(Polythrincium trifolii Kunze). On white clover this disease was reported from Connecticut, New York, Alabama, Louisiana, Indiana, and Kansas. It was also reported from New York on alsike and red clover and from Alabama on Trifolium reflexum.

The disease ruined at least one lawn at Manhattan, Kansas, but that is the only report of any particular damage.

Killian (3) states that the ascigerous stage of the fungus should be classified under the genus Plowrightia instead of Phyllachora.

Bacterial leafspot - Jones, Williamson, Wolf, and McCulloch (2) have described a leafspot disease of Trifolium spp. as due to Bacterium trifoliorum n. sp. Observations in various parts of Wisconsin, Iowa, Indiana, North Carolina, Virginia, Maryland, and in the District of Columbia indicate that the disease probably occurs widely in the United States, but has previously escaped notice through confusion with other leafspots of clover. The authors state that "The type strain from Wisconsin has proved pathogenic only on the red clovers (Trifolium pratense L. and T. medium L.); the strains from North Carolina and the vicinity of Washington, D. C., otherwise scarcely distinguishable, have been proved pathogenic also on T. repens L., T. hybridum L., T. incarnatum L., T. pannonicum L., and T. alexandrinum L. Lesions occur on leaves, stems, petioles, stipules, and flowers."

Leafspot caused by Sphaerulina trifolii E. Rostr. was reported by Hopkins (1) as having been observed at various points in Missouri, at Ithaca, New York, and Godfrey, Illinois, most commonly on white clover (T. repens). It has been found also on alsike clover (T. hybridum) and on red clover (T. pratense), and inoculation experiments indicate that mammoth clover (T. pratense perenne) is susceptible. Hopkins states that this is apparently the first report of the occurrence of this disease in America.

Leafspot caused by Pseudopeziza trifolii (Bernh.) Fckl. Slight amounts of this disease were reported from a few states, chiefly in the northeastern part of the country. In New York it was collected on alsike and white as well as on red clover. No especial damage was recorded.

Leafspot caused by Macrosporium sarcinaeforme Cav. - reported from Connecticut and Kentucky on red clover.

Cercospora sp. on alsike clover - reported from Indiana.

Dodder (Cuscuta sp.) - "A field of 10 acres in Washington County, Illinois, showed between 20% and 30% of the plants parasitized. This was just at the time the first crop was being cut." (Tehon)

General references:

1. Hopkins, E. F. The Sphaerulina leafspot of clover. Phytopath. 13: 117-126. Mar. 1923.
2. Jones, L. R., M. M. Williamson, F. A. Wolf, and Lucia McCulloch. Bacterial leafspot of clovers. Jour. Agr. Res. 25: 471-490. Sept. 1923.
3. Killian, Charles. Le Polythrincium trifolii Kunze parasite du trefle. Rev. Path. Veg. & Entom. Agr. 10: 202-219. July - Sept. 1923.
4. Marchionatto, J. B. Sobre la presencia de la Sclerotinia trifoliorum Erikss. en la R. Argentina. Rev. Fac. Agron. Univ. La Plata 15: 65-67. 1923.

5. Ware, W. M. Violet felt rot (Rhizoctonia) of clover. Jour. Min. Agr. Great Britain 30: 48-52. April 1923.
6. Young, W. J. An investigation of clover root rot. (Abstract) Phytopath. 14: 63. Jan. 1924.
7. ———— Clover root rots and powdery mildew. Mo. Bul. Ohio Agr. Exp. Sta. 8: 157-160. 1923.

SWEET CLOVER

Mosaic, cause undetermined. Although mosaic was reported on this host only from New York, Michigan, and North Dakota, it doubtless occurred in many other states. In New York it was very common on Melilotus alba and M. officinalis throughout the state. In Michigan it was reported by a grower as causing damage and was probably widespread in the state. In North Dakota it was noticed by collaborators in only one field.

Ascochyta sp. was noted by Edgerton at Baton Rouge, Louisiana, in April. This is the first report from the state. It was of some importance but only plants showing insufficient nodule inoculation were badly affected.

Anthracnose caused by Colletotrichum trifolii Bain was severe locally in Mississippi, according to Neal and Barker.

Mycosphaerella lethalis was generally destructive on full grown stems of Melilotus alba in New York, according to Chupp and Kirby.

COWPEA

Leafspot caused by Cercospora cruenta Sacc. – New Jersey, Delaware, Florida, Porto Rico, Mississippi, Louisiana, Texas, and Oklahoma all reported this disease. In Delaware and Florida, where considerable defoliation occurred, it was said to be the most important leaf spot. Three percent loss was estimated for Florida, 1 to 3% for Louisiana, and 2% for Texas.

Wilt caused by Fusarium vasinfectum tracheiphilum EFS. was reported from North Carolina (noted in two counties), Florida (common, one seven-acre field at Palma Sola a total loss), Mississippi (most serious disease of cowpeas), Texas (1% loss). (Reference: Mix, A. J. and Dorothy Lee Vaughn. The range of toleration of hydrogen-ion concentration exhibited by Fusarium tracheiphilum in culture. (Abstract) Phytopath. 14: 63. Jan. 1924.)

Powdery mildew caused by Erysiphe polygoni DC. Connecticut, New Jersey, Delaware, South Carolina, Mississippi, and California reported powdery mildew. Their reports indicate that it was generally distributed and more abundant than usual. No serious damage was mentioned, however. G. P. Clinton reports a case of abundant infection on Blackeye cowpea with only a very slight infection on New Era growing beside it.

Leafspot caused by Amerosporium oeconomicum E. & T. – New Jersey, Delaware (general), South Carolina (generally prevalent), Florida (widespread, very serious in vicinity of Gainesville).

Bacterial spot caused by Bacterium vignae Gardner & Kendrick. This dis-

ease, recently described for the first time (1), was reported to the Survey by Gardner and Kendrick as worse than last year in Indiana, but important only on the crop grown for seed. They also report the disease on specimens received from W. B. Tisdale and collected at Quincy, Florida. Since the disease is seed-borne it probably occurs rather widely, although reports have been received by this office only from Indiana, Florida, and Kansas. The Kansas report was accompanied by specimens which were determined by Gardner as being affected with B. vignae.

Fifteen varieties of Vigna sinensis, V. catjang and Phaseolus lunatus macrocarpus are susceptible according to Gardner and Kendrick.

Rust caused by Uromyces appendiculatus (Pers.) Lev. (cowpea strain) - Reported from Louisiana (slight), Texas, and California (on account of susceptibility of certain varieties such as Blackeye their culture is restricted to dryer portions of the State).

Leafspot caused by Phyllosticta phaseolina Sacc. Reported from Delaware.

Damping off caused by Rhizoctonia sp. - Virginia (in small spots on a field of Grey Crowder variety), Florida (scattered infections in seedling stage, some severe).

Root rot caused by Ozonium omnivorum Shear - Texas (prevalent).

Yeast spot caused by Nematospora phaseoli Wingard - Observed by H. W. Anderson for the first time in Illinois, November 5, 1923.

Pod rot caused by Botrytis sp. - Delaware.

A disease having the appearance of mosaic - reported from Payne County, Oklahoma.

Sun scorch - Dolaware (general).

Reference:

1. Gardner, Max W., and James B. Kendrick. Bacterial spot of cowpea. Science n.s. 57: 275. Mar. 2, 1923.

SOY BEANS

Bacterial pustule caused by Bacterium phaseoli sojense Hedges was reported by Miss Hedges (1) as known to occur in Texas, Virginia, Louisiana, South Carolina, and Kansas. A report is also at hand of the first collection of the disease in Delaware in 1923. In Louisiana, Edgerton estimates the disease as of considerable importance causing spotting of the leaves with some defoliation and occurring in all sections.

Bacterial blight caused by Bacterium glycineum Coerper - reported from Indiana (serious in seed crop, spotting leaves and pods, worse than usual) and South Carolina (important locally).

Pod and stem blight caused by Diaporthe sojae Lehman - Reported from North Carolina (2) and Indiana (noted in one field on Dunfield and Midwest varieties, September 14, fungus cultured and identified).

Downy mildew caused by Peronospora sojae has been described by Lehman and Wolf from North Carolina (3).

Fusarium wilt caused by Fusarium sp. - reported from Virginia (occurred in spots in field near Richmond), North Carolina (specimens received from one county, probably prevalent in others) and Louisiana (traces, first time disease has been noted).

SOY BEANS

Mosaic (undet.) reported from New York, Virginia, and Indiana. In the latter state it was said to be serious locally, one seed grower failing to obtain certification on account of it. The plants are stunted and the yield of seed reduced.

> "Prof. F. E. Robbins found mosaic in four out of twenty-seven fields inspected. Soysota shows resistance. Midwest is very susceptible." (Gardner & Kendrick)

Leafspot caused by Bacillus lathyri Manns & Taub. – Delaware.

Lightning injury – Delaware.

References:

1. Hedges, Florence. Soy bean pustule. Comparative studies with Bacterium phaseoli sojense Hedges and Bacterium phaseoli EFS. (Abstract) Phytopath. 14: 27-28. Jan. 1924.
2. Lehman, Samuel G. Pod and stem blight of soybean. Annals Missouri Bot. Gard. 10: 111-178. April 1923.
3. Lehman, S. G., and Frederick A. Wolf. A new downy mildew on soy beans. (Abstract) Phytopath. 14: 28. Jan. 1924.

VETCH

Leafspot caused by Ascochyta pisi Lib. In Delaware leaf and stem infection was very severe in some fields.

VELVET BEAN

Leafspot caused by Amerosporium oeconomicum E. & T. – collected near Gainesville, Florida.

Leafspot caused by Bacterium sp. – Louisiana.

Southern blight caused by Sclerotium rolsfii Sacc. was widespread and of serious consequence during the past season in Florida.

B. GRASSES

TIMOTHY

Rust caused by Puccinia phlei-pratensis Erikss. & Henn. Connecticut, New York, Kentucky, Minnesota, Iowa, Montana, and Washington reported this rust.

Smut caused by Ustilago striaeformis (Westend.) Niessl. – Reported from New York, Kentucky, Indiana, Illinois, Minnesota, and Iowa. In New York,

TIMOTHY

R. S. Kirby surveyed twenty fields for this smut and found an average of 5% in two fields with some spots running as high as 15%. Eight other fields had less than 1%. In Illinois a maximum of 20% was found in one field.

Leafspot caused by Scolecotrichum graminis Fckl. Collected in New York (one of the most, if not the most, destructive diseases of timothy, killing the leaves and probably causing a loss of about 2% for the state) and Minnesota (general throughout the state).

Take-all caused Ophiobolus cariceti B. & Br. Reported from New York (important only as a carrier).

Leafspot caused by Heterosporium phlei Gregory - New York.

Leafspot caused by Septoria sp. - Illinois. (Most common timothy disease; general; damage questionable).

MISCELLANEOUS GRASSES

Aplanobacter agropyri O'Gara

Agropyron smithii Rydb. - Nebraska, first report of this disease from Nebraska, specimens received.

Bacterium alboprecipitans Rosen

A new disease, reported by Rosen (9) from Arkansas on the following:
Chaetochloa geniculata (Lam.) Millsp. & Chase
Chaetochloa italica (L.) Scribn.
Chaetochloa lutescens (Weigel) Stuntz

Bacterium coronafaciens atropurpureum Reddy & Godkin (8)

Described on - Agropyron repens (L.) Beauv. and Bromus inermis Leyss. (natural infections) and other species of Bromus (inoculation) - Wisconsin, North Dakota; reported by collaborators on brome grass in North Dakota.

Bacterium panici Elliott (5)

Panicum miliaceum L. - Wisconsin, South Dakota.

Claviceps purpurea (Fr.) Tul.

Agropyron sp. - New York, Montana.
Agropyron repens (L.) Beauv. - New York, Michigan, Minnesota.
Agropyron smithii Rydb. - Minnesota.
Bromus inermis Leyss. - Minnesota, North Dakota.
Calamagrostis neglecta (Ehrh.) Gaertn. - Minnesota.
Elymus sp. - Montana.
Elymus macounii Vasey - Minnesota
Festuca elatior L. - New York.
Paspalum sp. - Florida.

Colletotrichum cereale Manns

Agropyron repens (L.) Beauv. - New York.
Agrostis palustris Huds. - New York.
Anthoxanthum odoratum L. - New York.
Bromus secalinus L. - New York.
Festuca elatior L. - New York.

Holcus halepensis L. – Mississippi.
Poa pratensis L. – New York, Ohio.

Cuscuta gronovii Willd.
Agropyron repens (L.) Beauv. – New York. Observed only under swamp conditions.

Epichloë typhina (Pers.) Tul.
Elymus canadensis L. – Minnesota.

Erysiphe graminis D.C.
Agropyron repens (L.) Beauv. – New York.
Agrostis sp. – Minnesota.
Dactylis glomerata L. – New York.
Elymus canadensis L. – New York.
Elymus virginicus L. – New York.
Poa pratensis L. – Connecticut, New York, Minnesota, Missouri.
Poa compressa L. – Minnesota.

Fusarium sp.
Paspalum sp. – Florida.
Paspalum dilatatum Poir. – Mississippi.

Helminthosporium sp.
Agropyron smithii Rydb. – New York.
Chloris gayana Kunth – Florida.
Dactylis glomerata L. – New York.
Elymus virginicus L. – New York.
Festuca elatior L. – New York.
Holcus halepensis L. – Florida.
Stenotaphrum secundatum (Walt.) Kuntze – Florida.

Helminthosporium bromi Diedicke
Bromus inermis Leyss. – New York, North Dakota.

Helminthosporium cyclops Drechsler (4)
Danthonia spicata (L.) Beauv. – Massachusetts (1920), Maine (1921).

Helminthosporium dictyoides Drechsler (4)
Festuca elatior L. – New York, Connecticut, Massachusetts, Maine, District of Columbia, Maryland, Virginia.

Helminthosporium halodes Drechsler (4)
Distichlis spicata (L.) Greene – New York (1920).

Helminthosporium leucostylum Drechsler (4)
Eleusine indica (L.) Gaertn. – District of Columbia (1921).

Helminthosporium micropus Drechsler (4)
Paspalum boscianum Flügge – Florida (1921).

Helminthosporium monoceras Drechsler (4)
Echinochloa crusgalli (L.) Beauv. – New York (1920).

MISCELLANEOUS GRASSES

Helminthosporium ravenelii Curt.
Sporobolus berteroanus (Trin.) Hitchc. & Chase (S. indicus (L.) R. Br.) - Florida (always attacked, 100% infected, and usually every head on the plant, hence the name "smut grass").

Helminthosporium rostratum Drechsler (4)
Eragrostis major Host - District of Columbia (1921).

Helminthosporium sativum P. K. & B.
Agropyron repens (L.) Beauv. - New York.

Helminthosporium siccans Drechsler (4)
Lolium multiflorum Lam. and L. perenne L. - Maryland, District of Columbia, Virginia.

Helminthosporium stenacrum Drechsler (4)
Agrostis stolonifera L. - Connecticut (1920).

Helminthosporium triseptatum Drechsler (4)
Notholcus lanatus (L.) Nash - New York (1920).

Helminthosporium vagans Drechsler (4)
Poa pratensis L. - described from Wisconsin, New York, Illinois, Maryland, District of Columbia, Massachusetts, Connecticut, Maine; reported by collaborators from New York and Indiana.

Mosaic (cause undetermined)
Brandes and Klaphaak (1) report that mosaic, proved by inoculation to be identical with that of sugar cane, has been collected on the following grass hosts:
Brachiaria platyphylla (Griseb.) Nash - Louisiana (New Orleans, 1920).
Chaetochloa magna (Griseb.) Scribn. - Florida (Dade County, 1920).
Paspalum boscianum Flügge - Georgia (Cairo, 1919 and 1920; Reno, 1920), Florida (Marianna, 1920).
Pennisetum glaucum (L.) R. Br. (pearl millet) - Georgia (Cairo, 1921).
Syntherisma sanguinalis (L.) Dulac - Georgia (Cairo, 1919; Reno, 1920), Florida (Chattahoochee and Marianna, 1920), Louisiana (New Orleans, 1919 and 1920; Plaquemine, 1920).
In addition, the following grasses (besides corn, sorghum, and sugar cane) were shown by inoculation to be susceptible:
Chaetochloa lutescens (Weigel) Stuntz.
Echinochloa crusgalli (L.) Beauv.
Miscanthus sinensis Anderss.
Panicum dichotomiflorum Michx.
Saccharum narenga (S. P. I. No. 38332) (wild sugar cane).

Ophiobolus cariceti (Berk. & Br.) Sacc.
Reported by Kirby from New York on the following:
Agropyron repens (L.) Beauv. - important as a harborer of this pathogene.
Agrostis palustris Huds. - trace, June 30, Cayuga County.
Bromus secalinus L. - June 30, Oswego County.

Phyllachora graminis (Pers.) Fckl.
Reported by Kirby from New York on the following:

Agropyron repens (L.) Beauv.
Agropyron smithii Rydb.
Elymus canadensis L.
Elymus striatus Willd.
Elymus virginicus L.
Hystrix patula Moench

Piricularia grisea (Cke.) Sacc.
Chaetochloa italica (L.) Scribn. - Delaware.
Syntherisma sanguinalis (L.) Dulac - Florida.

Puccinia andropogonis Schw.
Andropogon scoparius Michx. - New York.

Puccinia coronata Corda
Achyrodes aureum (L.) Kuntze - (3).
Festuca elatior L. - New York.

Puccinia dispersa Erikss.
Achyrodes aureum (L.) Kuntze - (3).

Puccinia glumarum (Schm.) Erikss. & Henn.
Lolium sp. - Washington.

Puccinia graminis Pers.
Achyrodes aureum (L.) Kuntze - (3).
Agropyron sp. - Colorado.
Agropyron repens (L.) Beauv. - New York, Indiana, Illinois, Minnesota.
Agropyron smithii Rydb. - New York, Minnesota, Colorado.
Agropyron tenerum Vasey - Minnesota.
Agrostis palustris Huds. - Connecticut, New York, Illinois, Wisconsin, Minnesota.
Anthoxanthum odoratum L. - New York,
Dactylis glomerata L. - New York, Kentucky, Indiana, Minnesota, Montana.
Elymus sp. - Colorado.
Elymus canadensis L. - New York, Minnesota.
Elymus macounii Vasey - Minnesota.
Festuca elatior L. - New York.
Hordeum jubatum L. - Minnesota, Indiana, Colorado.
Poa compressa L. - Michigan, Indiana (found in about six localities).
Tripsacum sp. - Florida.

Puccinia montanensis Ellis
Achyrodes aureum (L.) Kuntze (3)

Puccinia muhlenbergiae Arth. & Holw.
Muhlenbergia sylvatica Torr. - New York.

Puccinia pattersoniana Syd.
Agropyron spicatum (Pursh) Scribn. & Smith - Utah (6).

MISCELLANEOUS GRASSES

Puccinia phlei-pratensis Erikss. & Henn.
Dactylis glomerata L. - New York.

Puccinia poarum Niels.
Achyrodes aureum (L.) Kuntze - (3).
Poa pratensis L. - New York.

Puccinia triticina Erikss.
Achyrodes aureum (L.) Kuntze - (3).
Agropyron repens (L.) Beauv. - New York.
Elymus canadensis L. - New York.
Elymus virginicus L. - New York.

Rhizoctonia solani Kühn (brown patch disease)
Agrostis palustris Huds. - New York.
Capriola dactylon (L.) Kuntze - Florida.
Poa pratensis L. - New York.
Lawn grass - Connecticut.

Sclerospora graminicola (Sacc.) Schr.
Alopecurus geniculatus L. - Mississippi.
Chaetochloa magna (Griseb.) Scribn. - Florida.
Chaetochloa viridis (L.) Scribn. - New York, Minnesota, Iowa.

Scolecotrichum graminis Fckl.
Agrostis palustris Huds. - New York.
Anthoxanthum odoratum L. - New York.
Dactylis glomerata L. - New York, Missouri.
Poa sp. - Missouri.
Poa compressa L. - Minnesota.
Poa pratensis L. - New York.

Septoria graminum Desm.
Hierochloë odorata Wahl. - Minnesota.

Sorosporium syntherismae (Pk.) Farl.
Andropogon sp. - Colorado.

Urocystis agropyri (Preuss) Schröt.
Agropyron sp. - Missouri.
Agropyron repens (L.) Beauv. - New York.

Ustilago hypodites (Schlect.) Fr.
Agropyron repens (L.) Beauv. - Abundant in at least one orchard at Hall, New York, July 9. - Found in a field at Ithaca New York July 7.

LONGISSIMA

Ustilago ~~longissima~~ (Sow.) Tul.
Panicularia grandis (S. Wats.) Nash (Glyceria grandis S. Wats.) - New York.

Ustilago neglecta Niessl.
Chaetochloa lutescens (Weigel) Stuntz - New York.

MISCELLANEOUS GRASSES

Ustilago panici-miliacei (Pers.) Wint.
Panicum miliaceum L. - North Dakota.

Ustilago pustulata Tracy & Earle
Panicum dichotomiflorum Michx. - New Jersey.

Ustilago rabenhorstiana Kühn
Panicum dichotomiflorum - District of Columbia.
Syntherisma sanguinalis (L.) Dulac. - New York.

Ustilago striaeformis (Westend.) Niessl
Agrostis palustris Huds. - New York, Massachusetts.
Poa compressa L. - Indiana.
Poa pratensis L. - Massachusetts, Kentucky, New York, Indiana.

Wojnowicia graminis (McAlp.) Sacc. & D. Sacc.
Agropyron repens (L.) - New York.

Vermicularia sp.
Eleusine sp. - Florida.

References:

1. Brandes, E. W., and Peter J. Klaphaak. Cultivated and wild hosts of sugar-cane on grass mosaic. Jour. Agr. Res. 24: 247-262. Apr. 21, 1923.
2. Craigie, J. H., and Wm. H. Weston, Jr. Observations on malformed tassels of teosinte plants infected with downy mildew. (Abstract) Phytopath. 14: 49. Jan. 1924.
3. Dietz, S. M., and I. W. Clokey. Achyrodes aureum (L.) Kuntze, a host for many rusts. (Abstract). Phytopath. 14: 36-37. Jan. 1924.
4. Drechsler, Charles. Some graminicolous species of Helminthosporium. Jour. Agr. Res. 24: 641-740. May 26, 1923.
5. Elliott, Charlotte. A bacterial stripe disease of proso millet. Jour. Agr. Res. 26: 151-159. Oct. 27, 1923.
6. Garrett, A. O. The aecial stage of Puccinia pattersoniana. Mycologia 16: 33-35. Jan. 1924.
7. Petry, E. J., and Lynn D. Hutton. Conjugation in the aecium of Dicaeoma distichlidis. (Abstract). Phytopath. 14: 33-34. 1924.
8. Reddy, C. S., and James Godkin. A bacterial disease of brome-grass. Phytopath. 13: 75-86. Feb. 1923.
9. Rosen, H. R. A bacterial disease of foxtail (Chaetochloa lutescens). Ann. Missouri Bot. Gard. 9: 333-402. Nov. 1922.
10. Stakman, E. C., and M. N. Levine. Puccinia graminis on Poa spp. in the United States. (Abstract). Phytopath. 14: 39. Jan. 1924.

C. MISCELLANEOUS

SUNFLOWER

Rust caused by Puccinia helianthi Schw. was reported from Connecticut (very common on dwarf sunflower and Mammoth Russian at Station farm), New York (on H. annuus and H. tuberosus), New Jersey (flowers nearly mature before leaves were severely diseased), Florida, Oklahoma, Michigan (started late; caused complete defoliation at Agricultural College in October, severe in lower part of state but slight in Upper Peninsula), Wisconsin, Minnesota (of considerable importance locally, causing defoliation in some cases), Colorado, New Mexico (common on wild sunflowers all over the Valley), Arizona, Idaho, and Washington.

Wilt caused by Sclerotinia libertiana Fckl. - Michigan and Idaho are the only states reporting this disease in 1923. In Canada, however, it was reported from six provinces from British Columbia on the West to Prince Edward Island on the East. (Survey of the prevalence of plant diseases in the Dominion of Canada, 1923).

References:

Baribeau, B. Fletrissure et pourriture de la tige du tournesol dans la province de Quebec. (Sunflower wilt in the province of Quebec.) Sci. Agri. 3: 397-400. 1923.

Jones, E. S. Taxonomy of the Sclerotinia on Helianthus annuus L. Phytopath. 13: 496-500. Nov. 1923.

Downy mildew caused by Plasmopara halstedii (Farl.) Berl. & De Toni - New York (on Helianthus annuus, H. longifolius, and H. rigidus), and Minnesota (killing of plants and severe stunting).

Powdery mildew caused by Erysiphe cichoracearum DC. - Connecticut, New York, and Washington.

Leaf spot caused by Septoria helianthi E. & K. - Connecticut, New York, Michigan, and Minnesota.

General reference:

Gilbert, H. C. and A. W. Henry. Minnesota sunflower diseases in 1923. (Abstract) Phytopath. 14: 64. Jan. 1924.

Miss Florence Hedges,
Laboratory of Plant Pathology,
U. S. Department of Agriculture,
Washington, D. C.